

Running An Entrepreneurship Program Through A Mechanical Engineering Technology Department

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Abstract

For the past seven years, Eastern Washington University has run a successful entrepreneurship program through its E-Ship (Entrepreneurship) Center. Something different about our program is that although it starts as a program within the school of business, the director of the center is a Mechanical Engineering/Mechanical Engineering Technology faculty member. This director was selected due to his serial entrepreneurship activities outside of academia, bringing real world experience to the program and the hope of broadening the reach of the Technology Commercialization Academy (TCA). The TCA has now launched 74 student-owned businesses to compete in local pitch competitions, with over 39% still in business one year later. The TCA has provided unique opportunities for students across the entire campus and stands out as a unique recruiting tool for the university. During our most recent Mechanical Engineering Technology accreditation visit (Fall 2023) this program received a mention as a “Program Strength”. The ABET report states, “These experiences help prepare students looking for employment with or creating their own start-ups and small businesses, which are valuable engines of growth in the local economy”. This paper outlines the organization and growth of this program, a discussion of the programmatic strengths and weaknesses, and discusses some of the student successes from participating in this program.

TCA Overview

The Technology Commercialization Academy (TCA) is a dynamic, interdisciplinary educational initiative designed to cultivate entrepreneurial thinking and provide students with the essential foundations for business creation. Emphasizing experiential learning, the program integrates modern instructional methodologies that bridge the gap between theoretical knowledge and the complex realities of launching and managing a startup. While classroom instruction often presents idealized business frameworks, the unpredictable nature of entrepreneurship demands adaptability, innovation, and practical application.

Originally founded within a traditional business school setting, the TCA has undergone substantial transformation in its structure, content, and instructional approach over the years. Today, it operates as a comprehensive, 20-week entrepreneurial training program housed within the university and accessible to students across all disciplines. To facilitate the ideation process and business development, the program offers a fully equipped makerspace, expert mentorship, and an integrative curriculum.

This paper explores the foundational principles, evolution, pedagogical strategies, and impact of the program on student learning outcomes. It highlights TCA’s iterative approach to program

design, which integrates continuous feedback from students and faculty to refine its effectiveness—a methodology that mirrors the entrepreneurial ethos it seeks to instill. Through qualitative assessments, including student reflections and faculty evaluations, findings demonstrate that the program fosters key competencies in problem-solving, teamwork, creative ideation, and strategic thinking. Additionally, the TCA contributes to the broader goals of higher education by enhancing students' professional agency and civic engagement, equipping them with lifelong skills applicable across industries and career paths.

By presenting an adaptable model for entrepreneurship education, the TCA offers insights into how similar programs can be effectively implemented across various educational institutions, from high schools to universities. This paper serves as a resource for educators and administrators interested in developing or refining entrepreneurship training programs in higher education.

History of the TCA

The program traces its roots to 2017 when it was initially launched as The Technology Commercialization Academy (TCA) within Eastern Washington University's School of Business. Eastern Washington University is split into two campuses. One campus is located in a university district in the center of a larger metropolitan city but the main campus is located 15 miles southwest from the city in a more rural setting. The School of Business is located at the city-center location and not on the main university campus. Originally the TCA was run as an intensive eight-week summer boot camp dedicated to support students in technology-focused startup ventures and housed in the downtown campus location. Like many entrepreneurship programs across the country, students received a stipend to participate, but, unlike many of these programs, it was not limited to either business majors, or engineering majors [1], [2] but is open to students of all majors. Because it was run out of the business department in the downtown campus, the first cohorts primarily included undergraduates from various business majors with just a few engineering, and computer science backgrounds. The early years of the TCA reflected a strong emphasis on technical innovation and market-oriented product development.

Structured around lean startup methodologies, the TCA program prioritized rapid ideation, the development of Minimum Viable Products (MVPs), and direct customer engagement. Students participated in daily in-person workshops, team-based challenges, and mentorship sessions aimed at accelerating venture creation.

Drawing on concepts from both business education and design thinking, the program introduced students to tools such as the Business Model Canvas, market research techniques, and iterative product development strategies. In addition to structured coursework, students engaged with real customers, prototyped solutions, and adapted their business models based on feedback from local-area mentors, faculty advisors, and peer reviews. While the program effectively fostered

engagement and generated promising startup ventures, program directors quickly recognized several critical areas in need of refinement.

Challenges and Lessons from Early Program Iterations

The TCA program ran classes in the summer of 2018, and again in summer of 2019. Post-program evaluations and faculty observations identified several critical challenges within the initial iteration of the Technology Commercialization Academy (TCA), highlighting areas that required refinement to enhance the effectiveness of entrepreneurship training. The first two years, the student projects were assigned by the faculty, with the intention of keeping the business development within the eight-week structure. This had the negative effect of the students being less motivated as the projects were not their true passion and they didn't feel ownership of them.

One of the most significant obstacles was the program's highly compressed eight-week structure, which created substantial strain for both students and faculty. While the intensive format was intended to accelerate learning and business development, it inadvertently led to severe burnout among faculty due to the substantial time commitment required to maintain the fast-paced instructional delivery. The demands of daily workshops, individualized mentorship, and grading overwhelmed instructors, limiting their ability to provide in-depth feedback and meaningful engagement beyond scheduled sessions.

Students faced similar challenges with the rapid pace of the program. The rigorous schedule, which included daily assignments and project-based deliverables, left little time for rest or personal reflection. Many students found themselves dedicating nearly all available hours to coursework, with minimal opportunity for strategic thinking, iteration, or downtime. This level of immersion, while fostering an environment of urgency and focus, underscored the necessity of balancing intensive training with periods for recovery and deeper conceptual exploration. Without adequate time for reflection, students struggled to synthesize their learning and make informed business decisions.

Beyond personal workload concerns, the condensed timeframe also constrained critical aspects of startup development—particularly Minimum Viable Product (MVP) creation and customer discovery. Entrepreneurship, by nature, thrives on iterative refinement and ongoing engagement with potential customers, yet the limited duration of TCA prevented meaningful progress in these areas. Many student teams struggled to move beyond conceptual business models, unable to produce functional prototypes or gather sufficient real-world validation within the short window available. Establishing professional relationships and securing actionable insights from customers is a time-intensive process, and the accelerated nature of the program hindered students from building the organic connections necessary to refine their ventures effectively.

Additionally, the absence of a dedicated makerspace for physical product development posed significant challenges. Entrepreneurship relies heavily on experimentation, prototyping, and

iterative design, all of which require access to specialized tools, workspaces, and technical expertise. The lack of adequate facilities meant that students pursuing hardware-driven or product-based innovations faced significant disadvantages compared to those working on software or service-oriented ventures. Without access to essential equipment and materials, students encountered barriers in prototyping and testing, limiting their ability to validate business concepts and develop tangible solutions.

These limitations collectively constrained the program's ability to support a diverse range of entrepreneurial projects, ultimately impacting learning outcomes. Hands-on experimentation and practical engagement are critical components of effective entrepreneurship education, and the absence of infrastructure to support these activities restricted students from fully experiencing the iterative nature of business creation.

The lessons learned from these early challenges informed subsequent program refinements, leading to significant adjustments in structure, pacing, and resource allocation. The insights gained from student feedback, faculty observations, and real-world program implementation provided valuable guidance on designing an entrepreneurship curriculum that balances rigor with accessibility, ensuring that participants have the time, space, and support necessary to develop sustainable business ventures.

In January of 2020, Dr. Phil Appel, a member of the mechanical engineering/mechanical engineering technology faculty, was appointed as the Director of the Entrepreneurship (E-Ship) Center. He had observed that participation in the TCA by engineering and technology students had been historically low. In his role as E-Ship Director he made some changes in order to engage more engineering students in the TCA. First, the program was changed from a summer program to one that occurred during the regular academic year and extended it from eight weeks to twenty weeks. Many of the engineering students work as interns over the summer and therefore are not available to participate in a summer program. The twenty-week program also includes an additional ten weeks of drop-in faculty consulting available to participating teams. This change allowed a deeper and more robust exploration of venture ideas, iterative testing, and a more manageable pace of learning. By spreading out the material, students have more time to work on their weekly task, and teachers have a lower drain on resources per week.

Another change was to run the TCA on the main campus instead of the downtown location. The downtown campus houses the business program and locating the TCA at this campus resulted in primarily business majors participating and made the program a bit hidden from the larger main campus students. Relocation led to students from across campus participating over time as they could get to the meetings easily and were aware of the programs as marketing of the program was able to reach more broadly.

Having the TCA Director as part of the mechanical engineering/mechanical engineering technology department also placed the program amongst faculty with experience in the four core skills that instructors must have for this program:

- Marketing
- Prototype development
- Technology
- Repeated success with start-ups in the past

The engineering faculty at Eastern Washington University fit best with these needs for students. Emphasis is placed here that while all these skills are necessary, they can be split across any number of instructors. One instructor that has these skills is adequate, but a variety of instructors increases diversity of experience and teaching approaches. This allows the program to leverage broader technical expertise and startup knowledge across disciplines.

Another change is that projects are no longer provided to students involved in the Academy. Students either bring an idea or prototype of a project with them or sign on to be a part of another student's project in the current version of the Academy. The change to student driven ideas leads to more passion from the students. They are now far more motivated to spend the hours needed to research their ideas, experiment with prototypes, and take the many hours that is needed to complete the customer discovery process. The added duration also meant the students had the calendar time to go out and interview potential customers and get real feedback.

Relocation of the E-Ship center to the main campus has the further benefit of additional space, leading to additional grants that created a true makerspace. The makerspace, which emphasizes innovation through play, led to its naming as the Ideation Lab, and is now located in the mechanical engineering building. This lab can be thought of as a mega-maker space. The Ideation Lab provides access to numerous construction tools (3D printers, design software, laser cutter/engraver, soldering, electronic assembly, sewing, impulsive printing, etc.) as well as hired student staff that are available to assist students in prototyping and proof-of-concept for any projects they are working to develop. The Lab functions as a jumping-off point for students in the TCA program – they start in the Lab and figure out what their next step is in developing a prototype. The trained student staff also have access to the 25,000 square foot machine shops in the building which house a metal shop, wood shop, and a polymer/composites shop. Students also have the potential to access resources in the building's robotics and automation labs. The TCA has linked with the Ideation Lab making construction of prototypes even easier, and nearly unlimited in scope.

The redesign also saw a diversification of instructional staff. Instead of relying strictly on business or engineering faculty, additional instructors were brought in from the community, such

as investors and lawyers from the Spokane area. Other departments on campus were also utilized – for example professors from Management and Marketing assisted in giving lectures to the TCA students. By focusing on bringing in specialized instructors to cover varied topics, students had a broader exposure to real-world situations and concepts. This highlights the fusion of classroom-based instruction with applications outside of the classroom, where students take weekly lessons and apply them to their business. Other campus departments involved in the TCA include the Design Department, Mechanical and Electrical Engineering, Exercise Science, Art, Theater, Music Technology, etc. These faculty members are critical to the student success as they fill the role of on campus mentors, sharing their expertise with the students on their projects. Industrial mentors also meet with the students to help fill in the practical knowledge of starting a business in the local economy.

Furthermore, the revised program structure integrated failure as an important learning tool. The first prototype is rarely the one that goes to market. Working through initial setbacks and utilizing critical thinking to improve design is an instrumental part of the start-up process. While the Ideation Lab inherently caters towards businesses featuring physical products, the concept of pivots in businesses are equally applicable for companies offering services as well. Emphasis is placed on weekly team meetings with a mentor(s), who provide guidance in the development process for each individual TCA cohort.

The benefit provided to students in the original iteration of the Academy – aside from the knowledge and skills gained – was a summer stipend. With the program now occurring during the academic year, in addition to the stipend, it was decided during the 2022-23 Academic Year to offer course credit to students in the Academy. Mechanical engineering and mechanical engineering technology students can apply this towards one of their four required senior electives. Non-engineering students can receive the same credit but usually choose not to as it does not fulfill any graduation requirement outside of the engineering program. This may change as there is a large movement within the university to require some type of hands-on experience of all graduating seniors (see the Institutional Support Section below). There is also no class restriction on being a part of the Academy, although it is primarily juniors and seniors that enroll.

The Growing Need for Entrepreneurship Training

The need for entrepreneurship training continues to grow. In an era of rapid technological advancement, economic volatility, and increasing global interconnectivity, entrepreneurship has become a critical force for economic growth, innovation, and societal progress. Students in the Academy work to create a small business based upon the project they are developing. Small businesses form a cornerstone of the American economy, driving job creation and serving as engines of problem-solving for complex social and environmental challenges. According to the U.S. Chamber of Commerce, small businesses collectively employ over 61 million workers, representing nearly half of the American workforce. As such, cultivating entrepreneurial skills

among students—both at the university and K-12 levels—has evolved from being a niche pursuit to a fundamental educational priority.

Results from numerous researchers also indicate that the jobs of engineers are changing and require a greater skillset involving innovation and entrepreneurship [3]. As discussed, all engineers need to adopt this innovative mindset, but it is even more necessary where Eastern Washington University is located as local industry is generally smaller and engineers are expected to be more entrepreneurial. Despite widespread recognition of entrepreneurship's significance, traditional academic models frequently fall short in equipping students for real-world entrepreneurial success. Most curricula focus on discipline-specific knowledge acquisition, often neglecting interdisciplinary collaboration, creative risk-taking, and practical problem-solving. This gap between theoretical instruction and the adaptive skill sets required in entrepreneurial settings leads to a disconnect between classroom learning and actual industry demands. The last five years of the TCA have shown the interdisciplinary aspect to be a great asset to success. The most successful businesses launched had multidisciplinary teams.

Entrepreneurship skills are important not just to the graduating engineer, but also to the companies that employ them and to the local economy. As discussed by Maresch, et al [4], “. . . recent graduates from science and engineering are providing the gross flow of new, high-quality firms – over and above those of other academic entrepreneurs.” They state further that it is the engineering and science entrepreneurs that create new firms, far more so than other academic disciplines. See also, [5].

Universities and community organizations are uniquely positioned to address this challenge by fostering innovation and venture creation through structured entrepreneurship training programs like the Technology Commercialization Academy. These initiatives not only prepare students to launch their own businesses but also instill an entrepreneurial mindset and toolkit applicable across diverse industries and career paths. The skills acquired in such programs extend far beyond immediate business creation, serving as valuable assets in professional environments, personal endeavors, and broader economic ecosystems. Certainly, new skills are developed in engineering students by participating in an entrepreneurial experience, but on a more basic level, the experience helps improve the basic corps skills needed by all engineering graduates. A study at the University of Ottawa indicated that out of twelve attributes required of engineering students in an undergraduate program, seven out of the twelve were significantly enhanced by an entrepreneurial experience [3].

The Technology Commercialization Academy was conceived as a direct response to these educational and economic imperatives, designed to integrate active learning with institutional and labor market objectives. By combining theoretical instruction with hands-on experience, it ensures that students leave the program not only with knowledge but with practical strategies and a mindset primed for innovation.

Funding for the TCA

The funding for the TCA was predominately from the Herbert B. Jones Foundation through a series of grants. The HBJ Foundation was a philanthropic organization supporting entrepreneurial projects until its sunsetting in the fall of 2024. The organization allowed collegiate schools to apply annually for competitive grants for specific program goals. Additional funding came from the local power company and Wells Fargo bank. The College of STEM also contributed space, release time for the director, and a one-time cash contribution.

Institutional Support

For a program such as the Academy to succeed it needs strong support from the parent institution. The TCA received that support in several ways. One previously mentioned was the fact that two different colleges were able to “share” a faculty member to run it. The Director of the E-Ship Center/TCA is assigned to an engineering department, yet the E-Ship Center is run through the Business Department. Another important aspect of a successful entrepreneurship program involves university policies related to Intellectual Property. Our policy gives all rights over the ideas and projects to the students. Our Institution’s Intellectual Property policy reads:

“Except in the case of commissioned works (see section 3-2), and subject to any restrictions imposed by outside sponsoring or funding organizations, a student of the university who writes or produces any work shall have exclusive rights to the work.” [6]

The policy gives great incentive for students to pursue their projects knowing that they will be the benefactors of their projects.

Another support provided by the parent institution was the strong emphasis on applied learning, as is found in the work done in an entrepreneurship program like the TCA. The favorable experiences had by students in STEM fields at our university prompted a recent change to the overall university to emphasize these applied experiences across all disciplines. This resulted in the university adopting the tagline of, “Regional Polytechnic,” to advertise that applied emphasis.

All of this supporting infrastructure was necessary for the success of the TCA.

Program Structure: How It Currently Works

The revised TCA follows a linear structure through Fall and Winter quarters. The program begins with an intensive Kickoff Week, followed by weekly instructional modules and culminating in a final pitch competition.

Kickoff Week

Kickoff Week focuses on building strong cohorts centered on the best business ideas that students come up with. Activities and discussions are a major part of the early ideation process

during Kickoff week. The goal is to foster a strong sense of community within each individual cohort, but also between all students. The intensive beginning lays the foundation for a successful 20 weeks following team formation and venture ideation. Students engage in structured icebreakers and skill-building exercises that emphasize trust, communication, and interdisciplinary collaboration. Each student delivers a short pitch outlining all their past skills and experience. This provides early experience to pitching and public speaking, while helping instructors fit students with relevant skills into appropriate cohorts. After individual skills are presented, another round of pitches centered on possible business ideas happens. Some may enter the program with a vague or fleshed-out idea of their business direction, while others have not begun the ideation process. All levels of development are welcome in the Academy. These idea pitches help determine the business ideas that will be developed throughout the program duration.

During Kickoff Week, faculty and mentors guide participants through ideation workshops grounded in business design principles. These sessions help students identify real-world problems, map potential market segments, and identify their customer base. Teams are then formed based on shared interests and complementary skill sets, with faculty ensuring that each individual business has the required skills it needs. For example, students with experience sewing would be better suited to a clothing company than someone who only knows 3-D printing.

Kickoff Week starts on Saturday and ends the following Sunday. Weekend meetings run all day, while a few meetings run on the intervening weeknights. Industry mentors join mid-week for a series of introductory lectures on topics covered during the TCA, helping teams refine their ideas and prepare for development.

Ongoing Weekly Training

Over the following 19 weeks, students participate in weekly sessions covering core topics related to entrepreneurship. These include business modeling, identifying their customer base, marketing strategy, pro formas and accounting, intellectual property law, and MVP development. Instruction is delivered through a mix of lectures, case studies, hands-on activities, and guest speakers.

Weekly startup clinics provide a forum for teams to share progress, receive feedback, and troubleshoot challenges. Peer-to-peer coaching encourages mutual learning and builds a collaborative culture. Students also have access to the Ideation Lab to assist in prototyping, supported by makerspace staff and external instructional resources.

Faculty advisors conduct weekly check-ins with each team, offering personalized guidance and ensuring that learning objectives are being met. Students document their journey through reflective journals and milestone reports, which contribute to their final assessment.

Final Pitch Competition

The program concludes with a formal pitch competition. The format is designed to emulate real-world business competitions. Students gain experience pitching their business to successful investors, entrepreneurs, and faculty from the university ecosystem as well as in the local community. Teams present their businesses through pitch decks, product demos, and business plan presentations. The event simulates real-world fundraising scenarios and provides a platform for showcasing student accomplishments.

Many teams use this experience as a launchpad to apply for external funding, join incubator programs, or begin pilot testing of their products in the community. This highlights the Academy not as the destination for student businesses, but as the beginning of a life-long journey of innovation and development.

TCA success stories

The university employs a digital, online, end-of-course survey for every class. Students select a number from a Likert scale in answer to some standardized questions and then are able to add any feedback that they want to. The responses are completely anonymous. Because the system is only directed at students that enrolled in the TCA for credit it means that the responses are only from the engineering students and do not include any other participants in non-engineering majors. For the most recent year in which the TCA was completed (AY 2024-25), which would be the most mature version of the Academy, the overall course ranking on a scale of 0 to 5 was 4.50. The two top questions on the survey that are most relevant to the success of the program are shown below along with their average score. This data constitutes the four years since TCA students were allowed to enroll for credit. Also included are examples of some of the freeform comments included by students.

Question 1: The course as a whole was: 4.36 average

Question 2: The course content was: 4.64 average

Student comments from the surveys:

- “Dr. Appel genuinely cares about his students and fosters a unique community of entrepreneurship within his class. The knowledge and experiences gained from this course are unparalleled compared to any other EWU class I have taken. While the course extends over two quarters, some material felt slightly repetitive. Nevertheless, the final pitch and community potluck provided an excellent conclusion, leaving me excited to continue pursuing my business beyond the class. I strongly hope this program remains within the department, and that other instructors support or continue collaborating with Dr. Appel to deliver this exceptional content.”

- “My experience in the TCA this past quarter has been incredible. I have learned so much about start up companies and the processes to getting to market and making a successful start up company. My company HotShot has a clear path forward and we have essential skills under our belt to start making our first prototypes and start getting closer to market. I'm very grateful for the contributions Dr. Appel put into this course and I would recommend this course to others wanting to learn how to make a start up company succeed.”
- “Dr. Appel and the department faculty were great for initially kickstarting a product and getting help for learning how to market a product. The problems that I had with this course were that the faculty weren't always available for guidance like they offered to be and there were a lot of delays in getting my item requests ordered on time. These shipping delays really became a hurdle for me and my project, but I was still able to work on other things like marketing during the delays. If the e-ship center was a little more organized it might have made the experience better for me and a better resource for students overall. The initial guidance was good, but then it was up to students to drive forward their product and sometimes there wasn't enough resources to make sufficient progress. The program was great experience overall though.”
- “Dr. Appel seems to be one of the only professors that will take mediating between peoples as far as it needs to take. He doesn't mind dealing with very uncomfortable situations and his resolutions are always in the intention of benefitting everyone involved. I do think, however, many of the solutions end up being partially one-sided and groups suffer somewhat because of it. At the end of the day, I appreciate TCA, Dr. Appel, and everyone involved as I've come out of this class with a vast amount of knowledge.”
- “TCA has done a lot for me. It has helped me increase my confidence in myself, and it has allowed me to challenge myself personally and professionally. As a person, I have grown so much and I'm really happy with the direction I am heading. TCA is a great program and I hope that it continues to improve each quarter. Extremely happy I took part in the TCA.”
- “AMAZING!!!!”
- “Not every person is perfect, but Dr. Appel is coming dam close. He makes time to talk to individual students no matter what. Dr. Appel has done strides to connect the students with every type of person they need in order to start a business and has help us fine tune our thoughts as a mentor in such a capacity that I do not think any of us would be where we are with out his guidance. Thank you for retaining such a professional.”

One item that continued to come up in the students comments points to the fact that the program success depends a great deal on the individual that is running it. We were very lucky to have an

enthusiastic engineering professor with extensive experience in creating start-ups, intellectual property and securing patents, and a deep love of teaching.

There are many examples of highly successful businesses coming out of this training program, so choosing which to highlight is difficult. One that is noteworthy is Ultropia. Ultropia began as an Electrical Engineering Capstone project in 2021. Their project was to create a 2-in-1 washer and dryer that utilizes ultrasound technology to wash and dry clothes quicker and more efficiently. Students wanted to develop their product further and learn how to turn it into a business and were able to do this through the TCA. The project was very successful, and won the Eagles Pitch Competition, then the Ultropia team went on to win 1st place in three separate competitions: MIT's Climate and Energy Prize, the WSU Business Plan Competition, and the UW Global Innovation Exchange Competition. As of 2024 the team is further developing the product, with talks to begin implementing the technology in the hotel and hospital industries.

Another example is Astria; a cosmetic company specializing in custom fit 3D-printed press-on nails. This multi-disciplined company combined artistry, design, and knowledge of materials and technology to create a unique process. This process creates a perfect custom fit using LIDAR scanners, custom adhesives, and advanced resin printing to make a robust nail. They can produce nails that can be reapplied for months and eliminate the intensive UV radiation of their competitors. As of 2024, they are currently working towards mass production, they have acquired a small resin printer farm and are meeting a limited market demand. To expand further, they are looking for partners in the resin industry and have begun discussions with potential licensing opportunities.

Current Iteration: Broadening Access and Scope

As the program has matured, it has expanded its focus beyond technology-driven startups. Faculty recognized that entrepreneurial thinking that forms the basis of the program is not unique to technology companies and can instead be applied to businesses of any type. The information and process taught is relevant across all disciplines and industries, and that diverse perspectives enhance innovation. While initial cohorts focused on projects that were primarily engineering and technology focused, the current iteration of the Academy features students from across majors and interests – such as students from the education department and members of the archery club. This expansion has seen student projects that involve creating an online store to sell candies from around the world to a business started to sell hair-protection bonnets to women.

To support this broader approach to the program, the curriculum now includes examples and guest speakers from more diverse sectors such as fashion, marketing, digital media, and education. Students are encouraged to pursue businesses that provide a core value to their community while also supporting employees and helping strengthen the community. Social and environmental challenges can be addressed through creative enterprise.

Prototyping resources have been adapted to accommodate this diversity. For instance, students working on service-based or artistic ventures can access multimedia production tools and storytelling workshops through collaboration with the Art department. The program's commitment to inclusivity has resulted in more diverse cohorts and richer learning experiences.

Next CAs & Future Development

Because of the desire to involve students from all majors and backgrounds, it was decided to remove the word, "Technology," from the name of the program. Originally it was planned to rename it as, "The Commercialization Academy," to preserve the TCA acronym. However, it was found that people referred to it as, "The TCA," which translates as, "The The Commercialization Academy." For this reason, the current name is The Commercialization Academy, abbreviated as, CA.

Looking forward, the CA aims to deepen its academic integration, increase its impact, and contribute to the broader field of entrepreneurial education. Currently, the faculty member directing the program is looking to expand the diversity of instructors by bringing in professors from other departments to assist not just in lecturing and instruction but in the development of the program itself.

Faculty development initiatives are underway to train instructors from non-business disciplines to incorporate the entrepreneurial framework that the Commercialization Academy teaches. A parallel goal is to produce scholarship on the program's outcomes, pedagogy, and assessment strategies, contributing to the academic literature on experiential learning and innovation education.

Tracking over time of alumni outcomes will be implemented to measure the sustained impact of the program on students' careers, venture growth, and civic engagement. The program periodically reaches out to past participants in the program to get a gauge for each business that has gone and determine what factors into both successes and failures. The reality of start-up companies is that not all of them will be successful. Regardless of the outcome of each business, students always learn from their experience, and their feedback is vital to faculty in shaping the future direction of the program. Partnerships with local economic development organizations, public schools, and nonprofit agencies are also being explored to create a community-wide ecosystem of support for emerging entrepreneurs.

Moreover, efforts are being made to integrate sustainability and ethics into the core curriculum, ensuring that students not only build viable businesses but do so with a commitment to environmental stewardship and social responsibility. Case studies, expert panels, and community-based projects will provide students with deeper insights into the ethical dimensions of entrepreneurship.

Lessons Learned

Over the last seven years, many lessons were learned about how to help develop successful technology-based companies. Because using technology can be daunting, many competitive programs focus on phone applications and web-based marketing. Machining and manufacturing can scare those who are not familiar with the processes. The first lesson learned was that students need a place to come to try to make a part and be allowed to fail, repeatedly! This is an extension of our belief that students will increase their Entrepreneurship Intention more deeply when working on real projects rather than just theoretical studies, as is done in other models [5], [7]. Students also needed to be working on a project of their own choosing and not have it handed to them by a program director. As students work through their physical project through hands-on trial and error, they become comfortable with the tools and machines and become willing to expand their ideas. No longer do they want to do a phone app, but they want to make a PLC controlled device to sell, a widget they dreamed up. They are allowed to come play and learn. Once the students become comfortable with prototyping equipment, and comfortable at asking “what happens if...” then the real ideas for business start to emerge.

But this play takes time. The other key lesson learned is that the students are not ready to start until they have had play time. Additionally, any good businessperson must take the time to ask the potential customers “What do you NEED” and not ask “What do you want”. The customer discovery process is more important than the design process and requires hundreds of interviews. Eight weeks is far too few, and a year is worse. The length of the program at twenty weeks seems to be the right balance.

A third lesson learned is diverse teams make the best teams, and a team of all mechanical engineers (or other disciplines) is more likely to fail. When the team has all the same skills, there are gaps in the talent pool. A diverse team will have less gaps. But also, cohort development is a great lesson learned. Because of the sense of belonging the cohort creates, the teams all feel bonded to each other, not just within the teams. Therefore, when a team has a talent gap, they turn to the rest of the cohort to get help, often resulting in an exchange of skill sets. The cohort building has increased the success rate as they all help each other. This bonding did not happen during the rushed eight-week program and is not something the authors have observed in other programs, yet feel it is critical.

Conclusion

The Commercialization Academy exemplifies a responsive, interdisciplinary approach to teaching entrepreneurship in higher education. By fostering a dynamic learning environment that blends theory with hands-on practice, it equips students to navigate uncertainty, collaborate across disciplines, and pursue ventures that are both economically and socially impactful.

This case study contributes to the growing body of literature advocating for active, experiential learning environments within postsecondary education and underscores the value of entrepreneurial thinking as a foundational component of twenty-first-century pedagogy.

The ongoing evolution of the CA provides valuable insights for educators and policymakers seeking to enhance entrepreneurship education through inclusive, practice-oriented, and reflective programming. By institutionalizing entrepreneurial education across disciplines and aligning it with community needs, universities can play a vital role in shaping the next generation of ethical, innovative, and resilient leaders.

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