

IEEE STEM Grant Proposal: Empowering Tomorrow's Innovators through STEAM-TEAMS Challenge

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1. Executive Summary

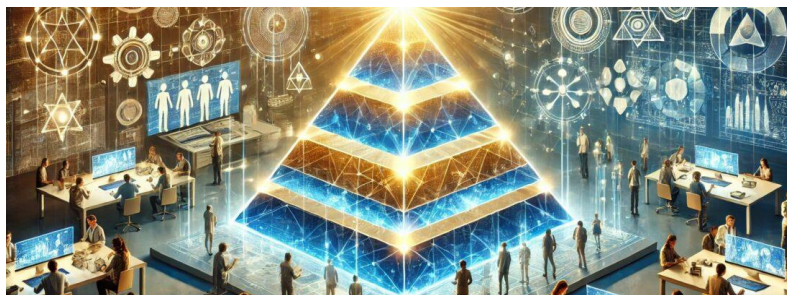
The current IEEE Pikes Peak Section (PPS) Section Chair, David Bondurant during November 2024 asked Dr John Santiago to implement a Region 5 initiative on Squishy Circuits to revitalize the STEAM/STEM program based on Dr Santiago's experience as Faculty Advisor for the IEEE Colorado Technical University (CTU) Student Branch (2008-2019).

In addition, with the significant help from the IEEE team of colleagues, **David Bondurant**, **Gene Freeman**, **John Reinert** and **Russ Bogardus**, the PPS has started to be revitalized with Dr. John Santiago as past chair, Jan 2019 – Feb 2023 and who was nominated by the late **John Meredith** during 2018. The section is making significant progress with David Bondurant.

However, the key leadership positions in PPS are mostly members from the Life Member Affinity Group (LMAG) and a mentorship and continuity program is needed in order for the PPS to be sustainable.

To provide some context based on this proposal, here are some key URLs links:

- List of **IEEE Student Activities** (<https://r5.ieee.org/pikespeak/student-activities>) at the IEEE PPS
- A short 6-minute **video of achievements, 2018-2022** (<https://r5.ieee.org/pikespeak/2023-section-history-and-achievements/>) and **2023 achievements** (<https://r5.ieee.org/pikespeak/2023-section-history-and-achievements/>) can be found at our website, including **strategic goals**, developed in 2020 and updated in 2022.
- **Squishy Circuits** (<https://r5.ieee.org/pikespeak/squishy-circuits/>) and other educational activities will be the spark and center-of-gravity for the STEAM/STEM activities based on the draft PPS **strategic plan** (<https://r5.ieee.org/pikespeak/strategic-plan/>).
- Budget: \$2000 (see budget section). See **Squishy Circuits** mini-site for list of components worth approximately \$200.



Based on the above background and need for a mentorship program (not emphasizing a recruitment only program but both recruitment with mentorship by leadership example), here is the overall strategic goal for this STEAM-TEAMS challenge:

*“For each year, each of the **current active and engaged members**, recruit one IEEE member and mentor the recruit to be an active and engaged member of the IEEE Pikes Peak Section. By your leadership example, have your recruit who is now an active and engaged member do the same as you did by recruiting one member.”*

The IEEE Pikes Peak Section proposes the “*STEAM-TEAMS Challenge*,” as a dynamic program where STEAM stands for

[S=Science],

[T=Technology],

[E=Engineering],

[A=Art/AI] where this is the art and Science of delivering AI-assisted multimedia STEAM content, and

[M=Mathematics].

Note that TEAMS is a rearranged form of STEAM where S has been moved to the end and to emphasize a multi-disciplinary TEAMS approach. The **strategic goal** can be found at the IEEE Pikes Peak Section Website at <https://r5.ieee.org/pikespeak/strategic-plan> designed to inspire and educate pre-university students in the Pikes Peak area. Leveraging hands-on activities like **Squishy Circuits** plus supplementary demos and participation in local events such as the **What IF... Festival**. This initiative aligns with our overall goals to enhance professional skills, invest in STEAM education, and foster innovation within our community.

The program integrates an expanded definition of the letter 'A' in **STEAM** to represent **Art + AI**, emphasizing **AI-assisted multimedia content** as a powerful tool for delivering engaging educational experiences. The IEEE Pikes Peak Section, hosted a **5-webinar series of AI** and its applications, including **increasing productivity with AI** and **STEAM/STEM education**. The program starts with Squishy Circuits and is leveraging the past experience of student branch activities, especially from the Colorado Technical University (CTU), College of Engineering, described as proof-of-work found in Appendix A.

Past and Future Aspirations

Below are our past achievements and future aspirations:



Left

1. (Starting at top left) Photos from past student activities. 2023 middle-school students briefing their future Colorado City.

2. Briefing about leadership at University of Colorado, Colorado Springs (UCCS kickoff meeting during IEEE Day on Leadership), Oct 2022 after being established as IEEE student branch in 2007-2008 timeframe

3. IEEE Colorado Technical University (CTU) Student Branch in 2010 hosted a Solar Parade of Homes Conference back.

4. (Bottom left) One of the veteran IEEE students shares his military experience to USAFA in 2019 (United States Air Force Academy) cadets. (Bottom left) Student Branch Students hosted.

Right: AI-generated visuals representing future goals and innovations.

More photos of above [student activities](https://r5.ieee.org/pikespeak/student-activities) and other activities can be found at <https://r5.ieee.org/pikespeak/student-activities>

2. Project Goals and Objectives

The attached document has real-world and past photos and AI-generated multimedia content on future aspirations Based on the draft [strategic plan](https://r5.ieee.org/pikespeak/strategic-plan/) of the IEEE Pikes Peak Section given at <https://r5.ieee.org/pikespeak/strategic-plan/>,

Strategic program goal is to have:

“For each year, each of the current active and engaged members, recruit one IEEE member and mentor the recruit to be an active and engaged member of the IEEE Pikes Peak Section. By your leadership example, have your recruit who is now an active and engaged member do the same as you did by recruiting one member.”

The above STEAM-TEAMS Challenge aims to:

- For the first year, we'll engage 50 or more students and PPS section members in interactive STEM activities. We anticipate the following years will double each year based on the above strategic goal and other follow-on activities such as Cool Science, Space Foundation, Summer of Discover, 21st Century Pike Peak Library District, and future **What-If Festival** Events. See past student activities at <https://r5.ieee.org/pikespeak/student-activities>
- Conduct monthly workshops feature hands-on training and education for the 20 active IEEE members of the Pikes Peak Section, Young Professionals, and IEEE student members for the first half of the year 2025. The second half of the year will be in preparation for the annual 'What-If' Festival in September 2025 in Colorado Springs, CO.



Facilitate mentorship through IEEE Young Professionals (YP). Ideally, Life Member Affinity Group (LMAG) members mentors YP members, YP mentors IEEE student members and all members educate the public on what IEEE is all about.

Showcase IEEE section and student projects at the annual **What IF... Festival**.

Inspire creativity and innovation using **AI-powered tools and multimedia content**.

"The What IF...Festival of Innovation and Imagination connects rural, suburban, and urban residents in the Pikes Peak Region. This day showcases the innovation and creativity of the Pikes Peak Region. Festival goers experience the breadth and depth of creativity/innovation through interactive presentations, hands-on demonstrations, exhibitions, and performances occurring throughout the Festival area.

"This festival has the power to help make our community a more amazing place by bringing people of all ages together to celebrate the power of creativity."

– Daniel Johnson, Director of The Innovative Minds Program, Colorado College

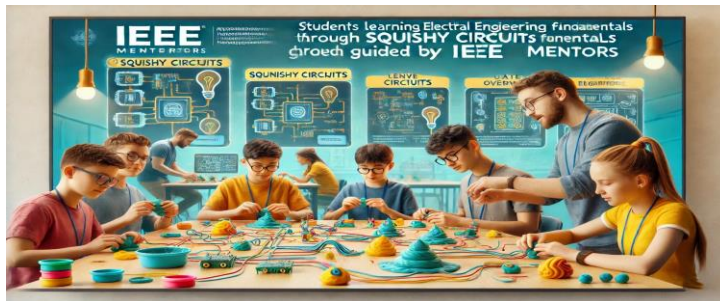
The What If...A Festival of Innovation and Imagination fills more than six square blocks of downtown Colorado Springs with “wows!” of all varieties. People of all ages, from all parts of the region, and from a wide-range of backgrounds and experiences join together for a day of innovation, imagination, and creativity.

Interested in participating?"

3. Project Description

Activity Framework:

- **Duration:** once a month (or 20 hours or more of training and education for IEEE members, university professors, k-12 educators), in preparation for ‘What-If’ Festival, scheduled during September 2025. Conduct workshops at the 21st library of the Pikes Peaks Library District.
- **Monthly Workshops:** Each session introduces a STEAM concept, culminating in a demonstration or hands-on project. See [Section Meeting Notes](#) on past activities.
- **Mentorship:** IEEE members mentor student teams, providing guidance and fostering an entrepreneurial mindset. At the end of four years and based on the strategic goal of mentoring one person per year by each active member, ideally there should be 20 STEAM-TEAMS, consisting of 8 teams members. Even at 50% success of the ideal cast of 10 STEAM-TEAMS, we believe this would be a successful goal and accomplishment. See mentorship mini-sites for [Young-Professionals](#) and [Life-Member Affinity Group \(LMAG\)](#).



Hands-On Projects:

- **Squishy Circuits plus more:** Students create circuits using conductive playdough to understand basic electrical principles.
- **Robotics Challenges:** Building simple robots or its components to grasp mechanics and programming.
- **Renewable Energy Models:** Learn about solar-powered devices and sustainable technologies.



4. One-Year Milestones and Schedule (Feb–Oct 2025)

Member Activity Log Form will be used to develop a comprehensive set of awards in terms of self-leadership, team leadership and organizational leadership. The **member activity form** (work-in-progress) can be found here:

https://docs.google.com/forms/d/1c8p9azwAR424_8nnD8ID14wWsnX-mZ4fWPoiMQBjZPQ/

The purpose of this form is to help you keep track of your progress in your activities as part of the incentives program found in the **strategic plan**.

- **February 2025:** Program Kickoff Meeting, Recruitment of Mentors and Participants
- **March–April 2025:** Conduct Weekly Workshops (1–4), Squishy Circuits Introduction
- **May–June 2025:** Conduct Weekly Workshops (5–8), Focus on Robotics Challenges
- **July 2025:** Mid-Year Evaluation and Adjustments
- **August 2025:** Conduct Weekly Workshops (9–10), Renewable Energy Projects
- **September 2025:** Final Project Showcase Preparations
- **October 2025:** Participation in What IF... Festival, Project Presentations, and Community Engagement Event
- **November 2025:** Program Review, Feedback Collection, and Reporting

Achieving Over 20 STEAM-TEAMS and 150 Members

1. The SMART goal's cascading nature ensures exponential growth:
2. **Growth in Membership:**
 - Starting with 20 active members, each member recruits 1 person annually:
 - **Year 1:** 20 active members recruit 20 new members → Total: 40 members.
 - **Year 2:** 40 members recruit 40 new members → Total: 80 members.
 - **Year 3:** 80 members recruit 80 new members → Total: 160 members.
 - By Year 4, the section exceeds 150 active and engaged members.
3. **Formation of STEAM-TEAMS:**
 - Membership growth allows for the formation of **20 STEAM-TEAMS**, each with 8 members:
 - These teams are small enough to foster trust and collaboration (aligning with **Dunbar's Number**) yet large enough to drive impactful projects.
 - STEAM-TEAMS focus on interdisciplinary initiatives, mentorship, and outreach, reinforcing the section's mission and strategic goals.

5. Budget Overview (Total: \$2000)

Item	Cost (USD)	Description
Workshop Supplies	\$800	Materials for more Squishy Circuits and simple motor projects for <ul style="list-style-type: none"> • 4 STEAM-TEAMS of 4-5 active members (\$200 per team) assumes 20% success rate out of ideal 20 STEAM-TEAMS • Simple hand-made motors for students to take home (consisting of one AA-battery, neodymium magnets, and a thick coil of wire)
Mentorship Resources	\$500	Training materials and STEM kits for demos (e.g. robotic gyroscope, simple hand-made motors, magnetic levitation, 3D printed material Aristotle's greedy cup)
Event Participation	\$500	Booth setup and materials for the festival.
Promotional Materials	\$200	Flyers, banners, and online advertising. See sample on-line marketing and advertising videos. Sample multimedia content... <ul style="list-style-type: none"> • YP minisite • IEEE PPS Video Playlist

Currently, the investment is to leverage Dr Santiago's experiences based on his private purchases or projects while as IEEE Student Faculty Advisor. (See past [student activities](#), [STEAM demos](#), and [e-learning widgets](#))

6. Evaluation and Sustainability Plan

Effectiveness Measurement:

- Pre- and Post-Program Surveys: Assess student knowledge, skills, and perceptions at the start and end of the program.
- Facilitator Feedback Forms: Collect insights from mentors on student engagement and program effectiveness.
- Project Outcomes: Evaluate completed student projects for technical quality and creativity.
- Festival Engagement Metrics: Track attendee participation and feedback at the What IF... Festival.
- Skill and Knowledge Evaluation:
 - Conduct skill assessments at the end of key workshops.
 - Host reflective debriefing sessions with students and mentors.

Sustainability Plan:

- Develop an annual review process to refine the program based on participant and mentor feedback.
- Establish partnerships with local schools and STEM organizations (work-in-progress).
- Create a repository of reusable learning materials for future cohorts (work-in-progress).

Other Considerations:

- Reusable Materials: Durable equipment for ongoing use in future workshops.
 - Mentorship Pipeline: Continued mentorship involving IEEE members and student alumni as given by strategic planning activities (<https://r5.ieee.org/pikespeak/strategic-plan/>)
 - Community Partnerships: Collaboration with local schools and organizations for long-term sustainability.
 - **University of Colorado, Colorado Springs (UCCS) Engineering Leadership Council** for industry engagement and workforce improvement/skillset
 - Industry Engagement in Pikes Peak Region and surrounding areas (<https://r5.ieee.org/pikespeak/industry-engagement-outreach/>)
 - Community Outreach in Pikes Peak Region and surrounding areas (<https://r5.ieee.org/pikespeak/community-outreach/>)
 - Scholarship of Teaching and Learning • United States Air Force Academy (<https://www.usafa.edu/research/research-centers/scholarship-learning-teaching/>)
- and IEEE Section Meeting Notes on SoTL (<https://r5.ieee.org/pikespeak/section-meeting-minutes/>)
- Kern Entrepreneurial Engineering Network (KEEN) (<https://engineeringunleashed.com/>)
 - American Society of Engineering Education (ASEE) (<https://www.asee.org/>)

7. Conclusion



The **STEAM-TEAMS Challenge** embodies the **IEEE Pikes Peak Section's** commitment to innovation, education, and community engagement. Through **hands-on STEM workshops, mentorship programs, and community showcases**, we aim to inspire the next generation of engineers and technologists.

Side-by-Side Visual Representation:

- **Left:** Collage of one of the past student projects involving 9 or more student. Other similar projects include: the ‘What-If Festival’ and ‘Space Foundation – Summer of Discovery’. (See [Student Activities](#))
- **Right:** AI abstract artistic visualization of the STEAM-TEAM ecosystem.

Prepared by: IEEE PPS and subject to approval and review by active members of the IEEE PPS EXCOM.

Point-of-Contact: Dr. John Santiago

- **IEEE Life Senior Member (2022 - Present, IEEE member since 1982)**
- **Region 5 Educational Activities Coordinator (REAC, Jan 2024- Present)**
- **Past Pikes Peak Section Chair (2019-Feb 2023)**
- **Current Webmaster (Jan 2016-Present),**
- **IEEE Pikes Peak Section, Past Faculty Advisor, IEEE Colorado Technical University (CTU) Student Branch (Dec 2007-Dec 2018)**

Email: john.santiago@ieee.org

Website: <https://r5.ieee.org/pikespeak/>

Appendix A

Mentorship Structure

The program incorporates a structured mentorship pipeline where:

- **IEEE Young Professional (YP)** mentor student teams and ripple effect.
- **Life Member Affinity Group (LMAG)** mentors YP
- Teams collaborate using STEAM principles guided by real-world project frameworks.

COMMUNITY OUTREACH



Side-by-Side Visual Representation:

- **Left:** A photo showing IEEE Colorado Technical University (CTU) student mentors guiding k-12 students.
- **Right:** AI-designed infographic explaining the STEAM-TEAM mentorship structure and its rippling (or compound effect).

Appendix B

Alignment with IEEE Pikes Peak Strategic Plan (currently in draft)

This project aligns with the IEEE Pikes Peak Strategic Goals:

- **Enhance Professional Skills:** IEEE members develop leadership and teaching abilities through mentorship roles. Here, IEEE members can develop their multimedia content for content marketing. Examples of multimedia content leveraging AI.
- **Invest in STEAM Education:** Innovative outreach programs to inspire future engineers.
- **Foster Innovation:** Encourage creative problem-solving and application of engineering principles.

More details can be found in the [IEEE Pikes Peak Strategic Plan](#).

Appendix C

Community Engagement

What IF... Festival Participation:

Students will present their projects at the **What IF... Festival** in Colorado Springs, engaging with the broader community and inspiring their peers.



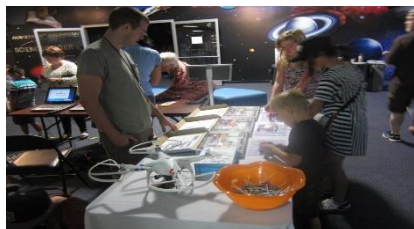
Left: Photo from a past **What IF... Festival** event demonstrate with solar and wind-powered system for RV vehicles

- **Right:** AI representation of a futuristic STEM booth with AI/AR exhibits.

Outreach Strategy:

- **Digital Updates:** Regular posts on IEEE Pikes Peak Section's social media (e.g. LinkedIn and/or YouTube) and website.
- **News Features:** Coverage on the [IEEE Region 5 News](#). If time permits, submit at IEEEtv.
- **Open Community Event:** STEAM showcase inviting families and local leaders.

Space Foundation... Summer of Discovery Participation:



Appendix D

Sustainability Plan

Sustainability Plan:

- Develop an annual review process to refine the program based on participant and mentor feedback.
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Other Considerations:

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Pikes Peak Section (PPS) Website (<https://r5.ieee.org/pikespeak>)

Appendix E

Proof-of- Work at IEEE

Pikes Peak Section (PPS) Website

- 1. Past Achievements (Real Photos)** – Highlighting significant moments from previous IEEE outreach initiatives:
 - **Student Activities**
 - **IEEE Region 5 Achievements Forum, 9 September 2022**
 - **Region 5 News Articles**
 - a. **Squishy Circuits**
 - b. **Mentorship**
- 2. Future Vision (AI Images)** – AI-generated visuals representing the envisioned future state of STEAM-TEAM projects, <http://r5.ieee.org/news/>. News articles by Dr. John Santiago
- 3. Comparison Grids:** Side-by-side layouts for key activities: Workshops, Mentorship, Community Events.
- 4. Strategic Plan:** Visual mind maps (or roadmaps) of program goals and mentorship flows.

Here is the **updated list** of 2024 recent articles by **Dr. John Santiago** from IEEE Region 5's **news** section:

1. What If? A MAP-Future Shaped by KEYSTONE Principles and the IEEE Pikes Peak Vision

- **Summary:** This article explores a future where technological innovation and societal harmony coexist, emphasizing collaboration, resilience, and ethical stewardship.
- **Read more:** [Read here](#)

2. What If One Mentor Changed Everything? A Thought Experiment for IEEE

- **Summary:** A thought experiment highlighting the impact of mentorship within IEEE, addressing challenges like plateauing membership growth and engagement.
- **Read more:** [Read here](#)

3. Thought Experiment: Building Tomorrow's Leaders with PyramidX-OS and IEEE STEAM TEAMS

- **Summary:** Imagines a world where young minds are inspired towards engineering and leadership through initiatives like PyramidX-OS and IEEE STEAM TEAMS.
- **Read more:** [Read here](#)

4. A Leader Builds Other Leaders: A Leader's Reflection for Engineering Students and Young Professionals

- **Summary:** Discusses the journey of self-leadership and team leadership for engineering students and young professionals, emphasizing that leadership is developed, not innate.
- **Read more:** [Read here](#)

5. Blockchain Technology and Voting Systems

- **Summary:** Explores how blockchain technology can enhance voting systems by providing transparency and decentralization, allowing citizens to verify that their representatives genuinely reflect their voices.
- **Read more:** [Read here](#)

6. Bitcoin Miners and Decentralized Banks: The Future No One Saw Coming

- **Summary:** A thought experiment designed to spark curiosity and inspire new perspectives about Bitcoin, bridging technical and philosophical concepts.
- **Read more:** [Read here](#)

7. Thought Experiment: Blockchain's Role to Improve and Evolve Within a Global and Existing Monetary System

- **Summary:** Explores how blockchain technology can enhance and evolve within the current global monetary system, fostering a deeper understanding of its potential.
- **Read more:** [Read here](#)

8. Do You See The Light In Bitcoin?

- **Summary:** A thought experiment aimed at bridging technical and philosophical concepts, fostering a deeper understanding of Bitcoin.
- **Read more:** [Read here](#)

9. The Mysterious Satoshi Nakamoto: A Humble Engineer or STEAM-Driven Collective And Philanthropist

- **Summary:** Encourages young professionals to reflect on the attributes displayed by Satoshi Nakamoto, fostering a deeper understanding of the origins of Bitcoin.
- **Read more:** [Read here](#)

10. Reimagining Global Stability: How Decentralized Technology Could Usher in a New Era of Sustainable Peace

- **Summary:** Imagines a world where global stability is maintained through shared cooperation and economic empowerment, moving beyond systems like Mutually Assured Destruction.
- **Read more:** [Read here](#)

11. Engineering a Better Economy: Why KEYSTONE-Based Technologies Matter More Than Ever

- **Summary:** Discusses the potential of engineering a global economy operating on principles of harmony, sustainability, and shared prosperity through KEYSTONE-based technologies. Includes squishy circuits applications of KEYSTONE concepts
- **Read more:** [Read here](#)

12. What If Every IEEE Member Followed the Fibonacci Mentorship Model?

- **Summary:** Explores a mentorship model inspired by the Fibonacci sequence, envisioning a world where IEEE members create exponential growth in mentorship and knowledge sharing.
- **Read more:** [Read here](#)

13. The Bridge, the Lighthouse, and the Stars: A Leadership Metaphor for Building Legacies

- **Summary:** Introduces a metaphorical framework for leadership, using the imagery of a bridge, a lighthouse, and stars to guide leaders in building lasting legacies.
- **Read more:** [Read here](#)

14. What If Leadership Could Be Engineered?

- **Summary:** Examines the concept of “engineering leadership” through structured methodologies, fostering a mindset where leadership principles are approached systematically and iteratively.
- **Read more:** [Read here](#)