



Building Professional Communities - Initiating Junior Chapters of MAES & SHPE to Increase STEM Awareness and Professional Practice

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Near-Peer Mentoring is recognized as an effective platform for advancing STEM outreach to communities of scholars, be they faculty, graduate- or undergraduate students, or K-12 students (Collier 2015, Pluth et al 2015). We report the creation and impact of a near-peer mentoring program created and administered by undergraduate STEM students, focused on building pathways and a sustainable practice to support students at high schools who are advancing towards undergraduate STEM studies.

Our student organization is a joint-chapter of Latinos in Science and Engineering (MAES) and the Society of Professional Engineers (SHPE) at The University of Texas at El Paso (UTEP). We have been working in unison to build engineering and science education outreach efforts into the high schools in our regions since 2009.

We share the rationale, process, and impact of establishing and developing these Junior Chapters of the Professional Society of Mexican American Engineers & Scientists (MAES) – also known as Latinos in Science and Engineering – and the Society of Hispanic Professional Engineers (SHPE) at high schools in the greater El Paso region. The Junior Chapters enable the University of Texas at El Paso (UTEP) MAES/SHPE Student Chapter to reach out as peer mentors to increase STEM awareness in our region, which consists of predominantly Hispanic communities, across several large school districts. In 2013 we expanded from one Junior Chapter to six established chapters. Now, in 2016, there are Junior Chapters associated with seven high school campuses in our region, which encompasses three school districts.

The value of establishing Junior Chapters is that it both promotes and supports high school students interested in advancing to STEM degrees at institutions of higher education, and it provides a near peer mentor experience that can assist the Junior Chapter members as they proceed through the process of seeking and transitioning to university studies. We are working to help students advance what we call the “SHPE driving pillars:” (1) academic development, (2) professional development, (3) outreach/community service, (4) leadership development, and (5) chapter development.

The UTEP MAES/SHPE Student Chapter welcomes Junior Chapters with student membership from all ethnicities for the purpose of increasing the number of Latino youth that enter and complete Science Technology Engineering and Mathematics (STEM) related careers. The UTEP MAES/SHPE Student Chapter is committed to high-standards of professionalism and academic achievement in engineering and science. Our chapter proactively changes lives by empowering the Hispanic student community to realize its fullest potential and to impact the world through STEM awareness, access, support and development. We envision a world where Hispanics are highly valued and influential amongst leading innovators, scientists, mathematicians and engineers.

The Junior Chapters provide added value through being simultaneously advancing leadership and resilience competencies, as well as personal and team/community service growth opportunities for the UTEP MAES/SHPE Student Chapter members and high school Junior Chapter members. The Junior Chapter Alumni members have been seen to continue their MAES/SHPE engagement as they move smoothly and better prepared into university life, and then become office bearers in their respective college student chapters, where they continue to positively influence more lives, enabling a process of continuous personal and community growth.

The process of establishing, operating and growing the Junior (Jr.) Chapters is student driven, owned and sustained effort.

Mission and Vision

The mission of the Jr. Chapters is to advance and empower Jr. Chapter highschool members through STEM education, leadership and professional development. Moreover, Jr. Chapters serve to provide college awareness and support for the Latino(a) community in the underrepresented fields. The vision of the Jr. Chapters is to create society leaders and innovators of tomorrow to represent Latino and minority communities in the areas of Science, Technology, Engineering and Mathematics.

History and Background

The Jr. Chapters initiated in the El Paso community date back to 2009, under the SHPE National organization efforts to support the creating pathways for high school students to transition into the college chapters, and then eventually the professional chapters upon graduation from university. The first-founded Jr. Chapter was established at the Center for Career and Technology Education (CCTE), which served as magnet school for diverse students from all across the El Paso Independent School District high schools. Due to its focus and engagement on technology careers, the Jr. Chapter gained a lot of popularity and there was a clear interest to establish additional chapters in high school.. By 2011, the CCTE Jr. Chapter was migrated to the El Paso High School (EPHS) campus in the El Paso Independent School District (EPISD), retaining the same Junior Chapter advisor and the vast majority of its membership. Subsequently, by Fall 2011, many of the these EPHS Jr. Chapter members had already begun their transition into college studies at The University of Texas at El Paso. This cohort provided the, the motivation and vision to expand this engineering professional organization to other high schools.

During 2012 many of the relationships and partnerships commenced between the Junior Chapters and local community groups and high school education staff. By the beginning of 2013 the groundwork was completed for expanding our efforts, with 5 high schools verbally committing to start the development of a fully-fledged Junior Chapter organization. Thereafter during 2013, with the formal commitment of high school administrative staff and their respective campus student we proceed to launch the The UTEP MAES/SHPE Jr. Chapter Program. With this development in our program, six high schools were now enrolled and actively participating with the The UTEP MAES/SHPE Chapter, MAES National, and SHPE National goals to increase

STEM awareness and opportunities to Hispanic students. At this time, the network had grown to include the following high schools: Cathedral High School, Coronado High School, Del Valle High School, El Paso High School, Mission Early College High School, Montwood High School and Valle Verde Early College High School. These schools encompassed three of our region's major school districts: EPISD, Socorro Independent School District (SISD) and Ysleta Independent School District (YISD).

The 2013-2014 school year was devoted to establishing and guiding these Jr. Chapters towards becoming sustaining and being internally managed. This was achieved through providing college and career resources, peer-to-peer mentoring, and professional networking opportunities. In the process of accomplishing these goals, many events and activities were hosted to incrementally increase participation in the programs beyond Junior Chapters of individual high schools, and engage them to be proactive in supporting and building their underrepresented communities. The 2014-2015 school year marked a further period of sustenance and growth, during which we focused on improving program experiences, such as mentoring and pathways to college, as well as expand opportunities to incoming freshman from the Jr. Chapters. This time also enabled the Jr. Chapters to initiate their own particular college student programs in the areas of academics, technical innovation and civic engagement.

Chapter Structure

The UTEP MAES/SHPE Chapter is composed of a total of ten (10) executive board members that work collaboratively with two (2) advisors. The ten (10) executive Board Positions are: President, MAES Vice President, SHPE Vice President, Vice-President of Internal Affairs, Vice-President of External Affairs - Corporate, Vice-President of External Affairs - Jr. Chapters, Treasurer, Historian and Webmaster. The Vice-President of External Affairs – Jr. Chapters oversees the Jr. Chapter Representative Committee, which is composed of the different Jr. Chapter Representatives for every high school having an established Jr. Chapter. Every Jr. Chapter has their own executive board team that work with their respective chapter advisor(s). A graphical representation of the administrative structure is shown below.

As shown in the schematic (Figure 1), the Jr. Chapter Representatives report directly to the Vice-President of External Affairs: Jr. Chapters, and all of the Jr. Chapter Representatives combine to form the Jr. Chapter Committee. The Jr. Chapter Representative primarily acts a liaison between the collegiate chapter and the high school chapter. Jr. Chapter Representatives have the responsibility to provide support and guidance to the high school students in the areas of academics, technical innovation, professional and leadership development focused on their specific needs. In addition, the Jr. Chapter Representatives become mentors and roles models that create an impact in the life of the students. This is particularly important in our context, where the Hispanic culture in our location leads to us seeking inspiring roles model with whom we an identify. This mentoring and counselling helps us as we individually create and advance career pathways. Also, the Jr. Chapter representative helps coordinate a build calendar with the Jr. Board, in order to plan ahead for any activities or events throughout the semester in collaboration with their high school and community events.

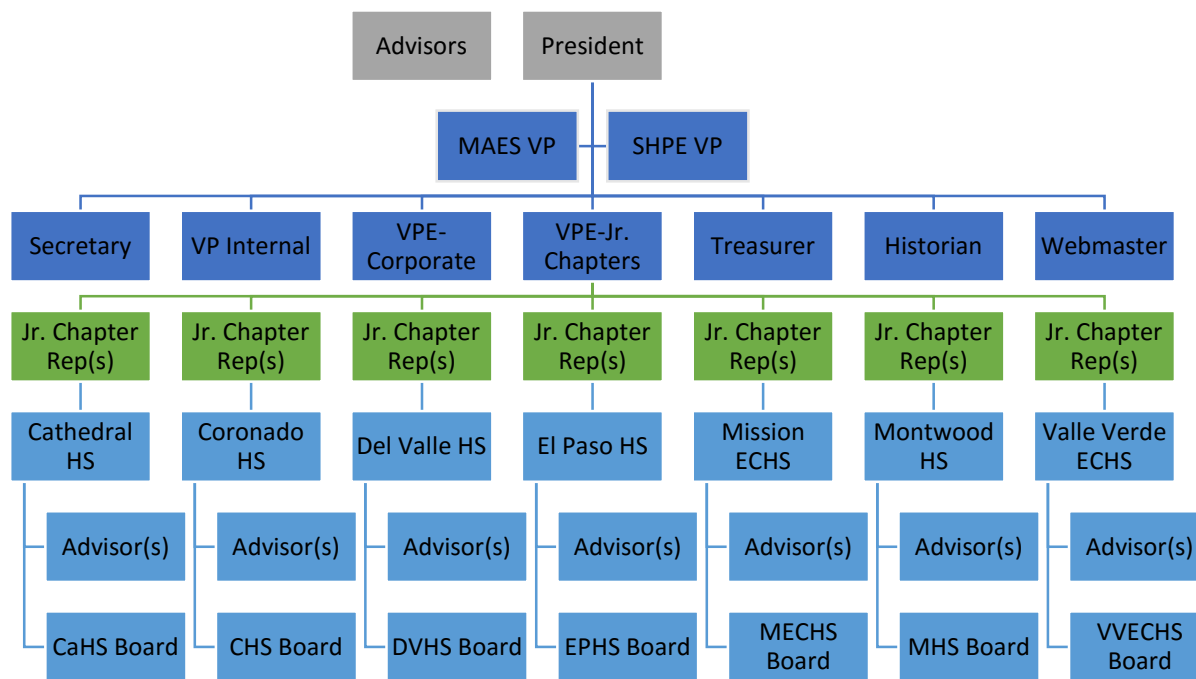


Figure 1: The administrative and reporting structure of the UTEP SHPE-MAES chapters

The Jr. Chapter Committee also partners with UTEP's College of Engineering to provide premiere access to on campus orientations, learning experiences and information sessions. Tours include our campus and research facilities, assisting with Engineering Shadow Day, STEM workshops and specific opportunities crafted for high school students to develop their interests in STEM fields at and beyond UTEP. Finally, after working along with high school staff and students, the Jr. Chapter Committee along with the VPE: Jr Chapter, plan a Leadership Conference for all the junior members to be able to network with other high school members, college students, professionals and industry representatives. The goal here is to build relationships and enable the Jr. Chapter membership to visualize themselves in a professional setting, in addition to gaining insights of the plethora of STEM careers.

Upon graduation, a Jr. Chapter Banquet is organized along with the collegiate chapter, to formally congratulate all the seniors, recognize members for their involvement, acknowledge their leadership, and contributions to the organizations and the Jr. Chapter Program.

Growth and Development

The support from SHPE and its sponsors, is provided to enhance the engineering education of Hispanic students and positively influence them to visualize becoming tomorrow's science and technology leaders. The organization conducts its programs through donations from private organizations and support from governmental agencies. The major role of SHPE is to provide scholarships for Hispanic students in science and technology. Since 2012, the SHPE professional society has been encouraging the establishment of a network to formerly include our high school

chapters, which SHPE refers to as SHPE Jr. SHPE is promoting the establishment of these chapters to augment the success of pre-college students by providing scholarships, mentors, tutors and other resources to overcome persistent educational barriers and encourage students to pursue science, technology, engineering and math (STEM) (SHPE 2016) . SHPE Jr. encourages and facilitates opportunities to attend the SHPE Foundation Pre-College Symposia, academic and engineering summer camps, and compete in events such as the National Science Bowl, local science fairs, and other engineering competitions.

The ultimate goal of SHPE Jr. is to increase the presence of Hispanics studying science and engineering. Our core values include five driving pillars: Academic Development, Chapter Development, Professional Development, Leadership Development and Outreach/Community Service.

Academic Development

A main driving force of the Jr. Chapter supporters is to diminish challenge of what we call the gap between high school and college. Programs such as Advanced Placement (AP), and International Baccalaureate (IB) are highly recommended to all members, since they offer opportunities to build a bridge to their future careers and for this to begin while they are still enrolled in high school.

It is noteworthy that two of the current Jr. Chapter portfolio are those established in Early College High Schools. In these innovative model high schools in our region, students who graduate can achieve an Associate's Degree during their high school education and then advance promptly, where functional, into the junior year of a 4-year institution such as UTEP. Another Jr. Chapter has two robotics teams whose technical skills, teamwork and innovation produce renowned success for students competing at the local and regional competitions. Our Jr. Chapter members have further competed in the First Tech Challenge (FTC Competition) and have advance to regional qualifier two years in a row (FTC 2016).

By collegiate students being near-peer mentors to high school students, we are not only empowering the Jr. Chapter member in how to succeed in their near future, but also an opportunity for the collegiate student to share best practices in: university applications, financial aid, housing, apartment search, major selection, etc.

Chapter Development

The Jr. Chapter members besides being leaders in their school and communities, they also have creative ways to have fun while at the same time doing proactive learning. They engage themselves in social activities, fundraisers, and soft skills event to develop that social interaction needed to lead and be a role model. This is the best way for them to practice how to properly and professionally interact among a group of individual with different backgrounds and ideas. Communication and strategic planning skills are essential to be successful in the Jr. Chapters and their interaction with society that will eventually help them along their professional career path. The Jr. Program is dedicated to strengthening their opportunities for development and success.

Professional Development

As part of the Jr. Chapter Curriculum, we emphasize professionalism in all the events and activities possible. The Jr. Chapter Conference (JCC) provides an opportunity to emphasize professionalism. It is an event focused on engaging High School students in the SHPE Jr. Chapter Program. The main purpose is to help them empower student's professional and personal development through experiential learning of different technical and academic activities, as well as giving them the opportunity to network with other Jr. Chapter members, college students, and industry representatives within a professional framework and environment. Since 2013, UTEP has hosted the largest Jr. Chapter Conferences nationwide, hosting more than 100 attendees, along with a variety of engineering companies and community partnerships.

Teamwork and Leadership Development

The establishment of the Jr. Chapters in the El Paso community is helping high school and college students grow and enhance their practical teamwork and leadership skills. By taking a leadership position either in the student chapter or Jr. Chapter, they are committed to advancing the organization and providing community service. This experience helps them to engage in community building, and through so doing they can become better leaders serving their community. They start to develop specific aptitudes and abilities to confront challenges in the areas of academics, social involvement, and community outreach. They also adopt continuous quality improvement mindsets, learning not only through failures and successes.

Community Service/Outreach

Due to our desire to increase our community outreach efforts in the El Paso community, we started hosting a Noche de Ciencias (Science Evenings) at our local Jr. Chapter schools. A Noche de Ciencias, or more aptly STEM night, is a series of events targeted to K-12 students and their parents. We seek to inspire students, encouraged by their parents, to pursue a STEM career. It is usually a fast-paced, two-track event, which for the students focuses on hands-on activities and critical thinking workshops. For parents, we host a series of panels providing information resources that help them to realize the opportunities their children can take advantage of if they decide to pursue a STEM career. During the event, students and parents can interact with attending university staff and professors, college STEM students, and industry professionals. This enables them to share their struggles and successes, and to relate to professions through meeting professionals, which helps them connect to real life scenarios and situates learning.

Benefits of Building Professional Communities

It is imperative that we start building professional communities such as those we have established, and to do so throughout our nation, in order to increase the number of students, male and female, entering into engineering related-careers. Through various techniques, such as, Project Based Learning (PBL) practices can be implemented with the purpose of better engaging and preparing students to know the workplace behaviors common to engineering careers. PBL is being implemented throughout our Jr. Chapter program to have students learn engineering

concepts, work in teams, research topic, practice their presentation skills, study a problem and come up with innovative solutions, and ask for guidance from near peer mentors, advisors, and university faculty, when needed. Through practicing PBL, we can better preparing our members not just academically, but also professionally, since these are the kind of practice-based experiences that commonly occur in the STEM workplace.

Results and Impact

Since the Jr. Chapter program started, we report a 100-% graduation, college acceptance and attendance rate for all seniors graduating through our program. According to the Pew Research Center, only 49% of Hispanic high school seniors, enroll immediately to college the following fall (Pew, 2016). Additionally, we have several Jr. Chapter Alumni “rock stars” that have helped shape the Jr. Chapter Program and made this program reputable and recognized. We will now share examples of these for the purpose of providing case studies.

Example Case Studies

Jose Martinez: Jose started as the first Jr. Chapter Treasurer at the Center for Career and Technology Education (CCTE) Chapter in 2009. Upon receiving a scholarship through networking with professionals, he proceeded to enroll at UTEP, where he became the Jr. Representative at his alma mater: El Paso High School (EPHS). The following year, Jose was elected Vice President of Internal Affairs, which prepared him for his next milestone. While he was President, he expanded the Jr. Chapter Program and outreach programs throughout the period of his leadership. He has since advanced to serve on the SHPE Region 5 Leadership Team. As the Regional Jr. Representative, he has the responsibility to oversee all of the Jr. Chapters in Texas, Louisiana, Alabama, Mississippi, Tennessee, Arkansas and Oklahoma.. In addition to his leadership positions, Jose has interned with Toyota and Goldman Sachs, as well as participated in research experiences at the University of Rochester in New York.

Carlos Ramirez: Another example of how the Jr. Chapter Program has changed lives is Carlos Ramirez, our current VP SHPE. Carlos started in the Jr. Chapter Program during his junior year at Montwood High School in the Socorro Independent School District (SISD). Coming from Mexico, the Jr. Chapter and Robotics team helped him adapt to the point that he said this community “feels like my home.” In his senior year, Carlos was the Jr. Chapter President and Robotics Captain, in which he led his team to the FTC Regional qualifier. After graduating from high school, he was awarded one of the three MAES Professional Scholarships to attend UTEP, where he became the Jr. Chapter Representative for his alma mater. The next year, Carlos was elected Vice-President External - Jr. Chapters. In this role he is currently overseeing seven of our Jr. Chapters.

Xavier Zapien: Another example of a SHPE Jr. chapter community builder is Xavier Zapien, who served as President of the Montwood HS Jr. Chapter. Xavier reports that he was able to expand his academic and technical skills thanks to the Jr. Chapter program of activities. Xavier was the valedictorian of his class. After graduation, he was offered and accepted a full-ride for his Bachelor, Master and Ph.D. degrees, all from the Massachusetts Institute of Technology, better known as MIT.

These examples serve to illustrate and exemplify the legacy and effectiveness of the investment of our resources in membership of the Jr. Chapter program at UTEP. Not only does it help spread STEM awareness, but as members get involved they see the value of being part of such a unique and structured program that will continue to yield benefits for them and those they serve for many years to come, as their own career pathways continue to unfold. The majority of the members see this as a “Lift as you Climb” process and methodology. It mirrors and replicates the goals we have in building and advancing success through STEM careers in our Hispanic community.

The Legacy in Our Community

We currently have seven Jr. Chapters established in our El Paso region, with a total of 190 members participating from across the entire El Paso metropole. As a group, our membership accounts for about 21-% of the National Jr. Chapter membership. El Paso is now nationally recognized for the success of our Jr. Chapter program: it was awarded the SHPE National Outreach and Community Service Award in 2015. The pie charts below, show a visual representation of membership by grade-level /classification (left) and gender (right):

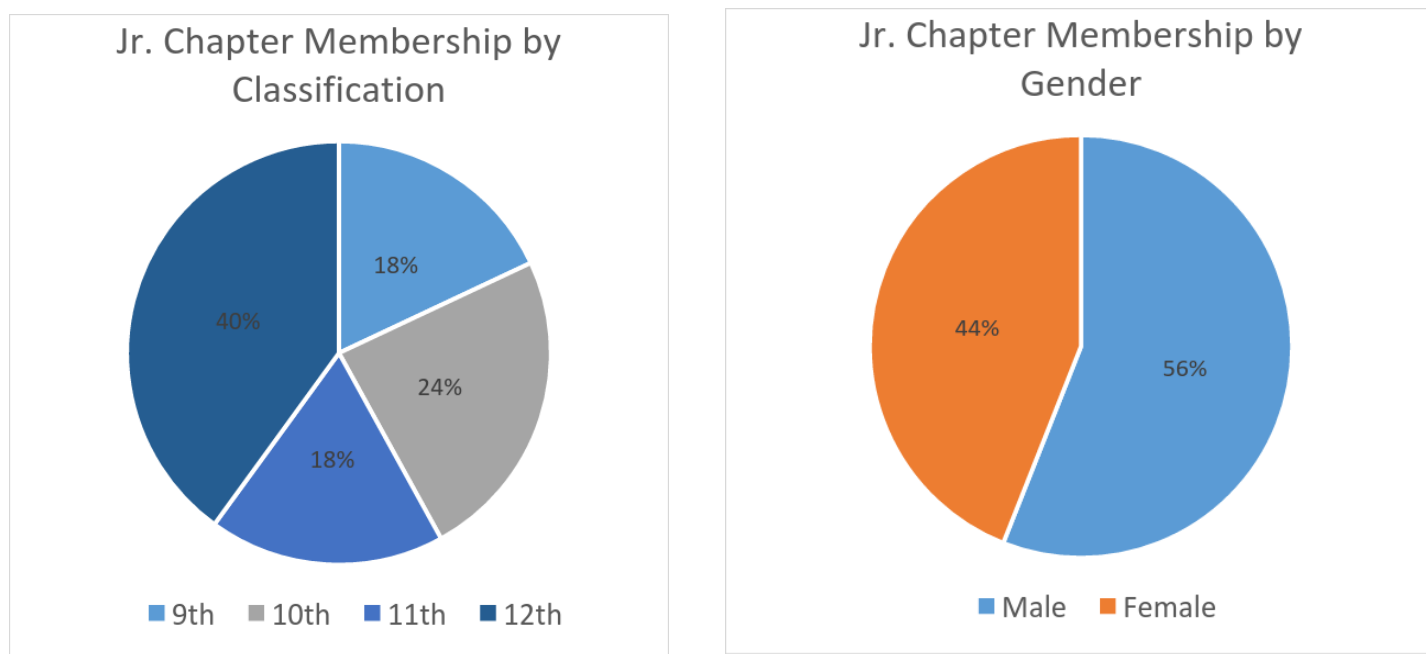


Figure 2: El Paso Junior Chapter membership distribution by classification and gender

Currently, the most populous membership is classified as a senior and as they graduate the goal is for them to continue developing their careers in STEM education and giving back to the community. Also, we are glad to have almost half of our membership being females. In the STEM fields, women can be underrepresented, however in our Jr. Chapter Program, women clearly demystifies the current national statistics that women do not pursue STEM careers.

Creation, Sustainability & Growth (i.e. Best Practices)

In order to establish and develop a Jr. Chapter, a three-party agreement must be formed. Commitment from college member(s) to serve as Jr. Representative and be the bridge between the college chapter and the Jr. Chapter. Secondly, obtaining support from the school staff and teacher(s) that would like to serve as Jr. Chapter Advisors/Sponsors and oversee the Jr. Chapter activities is needed. Lastly, active participation of high school students willing to participate in the program is essential. Once there is an informal agreement of the three-parties, the college chapter submits the official paperwork to SHPE National for approval, such paperwork includes information about the high school's address and staff, personal information of the high school students,

In order to sustain a Jr. Chapter effectively and continuously improving, the Executive Board elects a Jr. Representative, who is crucial to sustaining the Jr. Chapter.

Jr. Chapter Representatives attend a three-day intensive retreat in which they get to learn the procedures and policies associated with working with our school districts. For example, Minor Protection Policies are established our ISDs, and the university requires representatives to complete a Child Protection Seminar in order to be prepare them for professional interactions with high school students. Also, they learn the various processes and programs established the student chapter and the SHPE National Curriculum, and how to take advantage of opportunities through programs and/or grants that can aid in developing new projects, so as to better guide the minority groups of student towards STEM careers and opportunities.

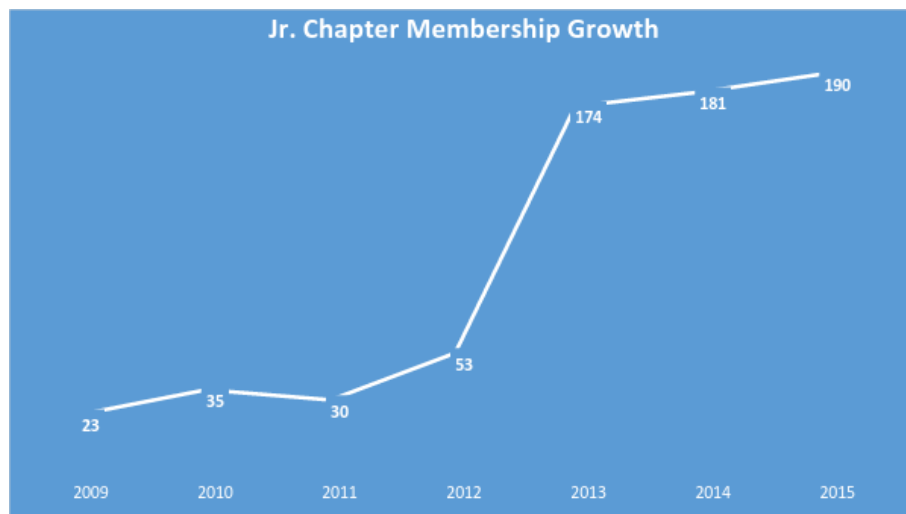


Figure 3: Membership growth in SHPE Jr. chapters in the El Paso region

Concluding Remarks

The high school students participating in the UTEP MAES/SHPE Jr. Chapter Program have gained knowledge and develop their STEM skills in focus areas.

- Leadership
 - Opportunity for members to serve in officer roles
 - Through different events/activities members can develop their leading skills
 - Develop membership teamwork and member “people skills”
 - Learn about delegation, followership and goal-setting
- Academics
 - Obtain and benefit from academic mentorship and tutoring
 - Access to scholarships and internships
- Professionalism
 - Introduction to the basic implementation of professional skills
 - Development of public speaking skills
 - Opportunity to network with college students and industry representatives
- Technical Innovation
 - Participation in STEM events, including, for example, robotics competitions
 - Interaction with university research opportunities and competitions
- Community Enrichment
 - Engagement with STEM awareness in schools and outside the classroom
 - Contributing back to school and district community.

References

Collier, Peter J., Developing Effective Student Peer Mentoring Programs: A Practitioner’s Guide to Program Design, Delivery, Evaluation, and Training, Stylus Publishing LLC, October 2015.

FTC (2016) Retrieved from: <http://www.firstinspires.org/robotics/ftc>

Pew Research Center: Hispanic Trends Project RSS

<http://www.pewhispanic.org/2013/05/09/hispanic-high-school-graduates-pass-whites-in-rate-of-college-enrollment/>

Pluth, Michael D., Boettcher, Shannon W., Nazin, George V., Greenaway, Ann L. and Hartle, Matthew D., Collaboration and Near Peer Mentoring as a Platform for Sustainable Science Education Outreach, J. Chem. Educ., 92 (4), pp. 625- 630.

SHPE Jr. Chapters (2016) Retrieved from:

http://mars.shpe.org/nila/usb/handbook/Chapter%2011%20SHPE_Jr_Business_Plan072012.pdf