A decade-long programmatic study of SHPE's chapter reporting program: best practices, lessons learned, and outcomes for national engineering diversity chapter-based organizations (Experience)

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Dr. MauroRodriguez Jr is a post-doctoral researcher at the California Institute of Technology focusing on cavitation bubble dynamics in and near non-linear viscoelastic materials under the supervision of Professor Tim Colonius. He earned with doctorate in mechanical engineering from the University of Michigan, Ann Arbor under the supervision of Associate Professor Eric Johnsen. Rodriguez's doctoral thesis focused on high-fidelity computational fluid dynamic simulations of bubble dynamics near (linear) viscoelastic media. In 2012, he received Masters of Science in mechanical engineering from Stanford University as a graduate engineering fellow. In 2010, Mauro earned his Bachelors of Science degree with honors in mechanical science and engineering from the University of Illinois at Urbana-Champaign (UIUC). Rodriguez is committed to increasing Hispanic participation and success across all levels of science, technology, engineering and math (STEM) workforce pathways. He has served in several national leadership positions for the Society of Hispanic Professional Engineers (SHPE) since 2009.

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Karen Mariela Siles is a Senior Delivery Manager at the IBM Corporation in Austin, TX. Her current role involves leading the delivery and development of the new IBM service, Virtual Private Cloud Block Storage. She manages a team of 14 individuals and assists Software Engineers and DevOps Engineers to work together to get this service delivered, maintained and supported. Siles has been with IBM since 2007 and has held 10 different roles within IBM. In her role, she collaborates with other Cloud Infrastructure teams and together they released a new IBM product that was available to the public this June. Some of Siles' roles within IBM have included Software Engineering, Software Support, Cloud OpenSource technologies, and currently managing in the Cloud Infrastructure organization. Siles has been the chair for the Hispanic Employee Resource Group at IBM Austin- Hispanics in Partnership- for the past three years but an active participant for the past 12 years. Along with these activities, Siles has achieved a lot of technical recognition through patent filing with IBM. She has filed 5 patents and published 4 patents, achieving her first Patent Plateau in 2018. While being part of IBM, Siles participated in the companies' Corporate Service Corp Program in 2015 where she was stationed in Manila, Philippines to provide pro-bono consulting to local agencies. This past May, Siles obtained her Master of Science in Technology Commercialization (MSTC) degree from the University of Texas- Austin – McCombs School of Business where she was awarded the Gary Cadenhead Award for Outstanding Leadership from the McCombs School of Business, MSTC Program.

Siles enjoys giving back to the community through various organizations that focus on overall education specifically in the fields of STEM, as well as female empowerment and equality. Siles' longest philanthropic achievement has been with the Society of Hispanics Professional Engineers (SHPE). As a lifetime member, Siles has been volunteering with SHPE since 2003 through various roles. These roles included George Mason University Undergraduate Chapter, SHPE Austin Professional Chapter, National Board of Directors from 2011-2013 representing Region V- Vice President. For the past two years, Siles has been helping as the chair for National Affairs Committee (NAC).

Dr. Dora Louise Renaud

Dora Renaud currently serves as the Senior Director of Academic Programs and Professional Development of the Society of Hispanic Professional Engineers (SHPE). Dora oversees the development and management of grants, scholarships, professional development, and programs that address the needs of SHPE members. For over a decade Dora has been part of American College of Education, impacting educators across the world by developing curriculum and teaching master level courses in education administration, curriculum and instruction, and bilingual education. Prior to working for SHPE, she was a public school

administrator serving campuses with over 1,500 students. Dora also served as the instructional specialist and curriculum director for 245 elementary, middle and high school campuses. She has collaborated with other faculty and departments across the nation to develop graduate programs with clear course objectives, learning outcomes and engaging, rigorous curriculum that leads to student achievement. Dora has been an international literacy trainer with a focus on linguistics, literacy development, and second language learners. In addition, she has served on the boards of directors for the Association of Hispanic School Administrators, Texas Reading Association, and Chess for Humanity. Dora is a former fellow of the Teaching Trust Executive Leadership Teams Program where she learned how to lead with trust and influence in order to achieve results and increase technical competence of her team while simultaneously increasing the team's effectiveness. She has been a part of the Game Changers Executive Training visiting highly effective corporations to learn from CEOs on how to build strong culture and climate. Dora was selected to participate in the Cooperative Superintendency Program which is an executive leadership program to gain the skills necessary to become effective superintendents. Dora earned her doctorate in Education Administration from the University of Texas at Austin in 2014. She has a Master's of Science in Reading, Bachelors of Science in Interdisciplinary Studies and a specialization in Bilingual Education. Her published research is in the area of professional development for educational leaders. Dora is a fluent Spanish speaker and enjoys learning new languages. She is a native Texan with strong Hispanic roots. During her spare time, she loves spending time with her family and friends traveling, reading, cycling, and most importantly spending time with her three dogs Tessa, Max and Hanz.

A decade-long programmatic study of SHPE's chapter reporting program: best practices, lessons learned, and outcomes for national engineering diversity chapter-based organizations (Experience)

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Abstract

A decade-long account of Society of Hispanic Professional Engineers' (SHPE), a national non-profit STEM diversity organization, nation-wide chapter development, reporting, and compliance program is presented. In the late 2000's, the program transitioned from the End-of-Year Report (EOYR) to the National Report Program (NRP). Throughout the 2010's, SHPE underwent internal infrastructure changes, including an inter-organizational merger, to expand and better fulfill its mission to serve the Hispanic community. In turn, the NRP underwent changes from the EOYR to via Strengths, Weakness, Opportunities and Threats analysis. The current iteration supplements on the former by targeting chapter growth, development, and management through a Science, Technology, Engineering, and Math (STEM) workforce-preparedness educational framework. The program has grown past its namesake of reporting and compliance to the leading program that educates and prepares chapter leaders on the necessary management and operations tools for mission alignment and compliance towards member success. The current NRP programmatic structure serves as a data- and best practices-driven chapter development framework to prepare Hispanics STEM professionals for the STEM workforce and ensure organizational mission fulfillment. Lessons learned, current outcomes, and developments from the decade-long history are also presented. The current NRP serves as an example of best practices for other peer chapter-based national STEM diversity organizations.

1. Introduction

The rise of national non-profit, chapter-based engineering diversity organizations, particularly those based on identity diversity (e.g., ethnic diversity), began to rise in collegiate and workforce settings during, if not in the wake of, the civil rights movement (e.g., mid-1960's to early 1970's). These organizations while small upon their founding, in the tens to hundreds of founding members, quickly grew two to three orders of magnitude in membership and reach through the country, particularly within the collegiate sector. These organizations share similar features that enabled them to thrive and maintain a steady supply of members, a: (i) focus on providing skills and community for students transitioning into college and, later, the STEM workforce, (ii) national workforce development and employment attainment conference(s) for the students and early professionals, and (iii) charter organizational affiliation system with a partnering institution (e.g., the university or in a community/city) that would enable proliferation and

development of skills needed throughout both transitions. From these core components, organizations increased their hierarchical decision-making and management sophistication with high-level directors (typically, a board of directors), dedicated staff, and subject-matter volunteer personnel. The third component introduced chapters at universities (occasionally referred to as student club organizations) where such groups thrive under continuous development and building community [1, 2]. Within this rise of sophistication, organizations' membership appeal and educational demographic reach increased from the college and workforce transitions to incorporate K12 education up to senior manager or executive level preparation. These efforts focus towards and catered to a demographic of members based on their current career position and trajectory as part of its nationalized programming (typically occurring at their broadband national conference(s)). While these conferences can form a significant percentage of the organization's total membership, it seldom hosts the full membership and typically takes place over the span of a few days. As a result, this semi-annual to annual episodic programming, while effective for standardized, intervention-like programming, is limited in duration and scope in terms of workforce development compared to local chapter-based programming. However, local programming poses challenges as it is highly dependent volunteers' self-efficacy and heterogenous in available resources and knowledge capital to obtain national uniformity. To the authors' knowledge, limited to no information about chapter-based programming or its evolution is available in the literature from these organizations. It is noted that there have been engineering education research of students' academic performance in their participation in national engineering diversity organizations [3, 4]. This experience report provides a decade-long insight into Society of Hispanic Professional Engineers' (SHPE) chapter-based programming.

SHPE has continuously grown from a single professional chapter in Los Angeles, CA to an organization comprised of over 200 student and 80 professional chapters across the U.S. SHPE's mission is to change lives by empowering the Hispanic community to realize its fullest potential and impact the world through STEM awareness, access, support and development.[1] As the organization grew across the country through the 1980-1990s, SHPE's internal organization infrastructure evolved and consisted of a staff and board that focused on the fiduciary, governance, and operational duties of the organization. Throughout the 1990s-mid 2000's, the chapter and membership growth of the organization stemmed from the growth of its aforementioned episodic, event-based programming, i.e., National Technical Careers Conference (now the SHPE National Convention[2]), National Institute for Leadership Advancement[3] (NILA), and the Regional Leadership Development Conferences (RLDCs)[4]. As aforementioned, these episodic programs are aimed at members in between two transitions: (i) high school to college and (ii) college to incoming workforce professionals. SHPE expanded its episodic programming over the past two decades to K12 talent development and senior management and executive. The episodic event-based

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[1] SHPE's mission was also part of the organization's sophistication and was created in 2010.

[2] The SHPE National Convention consists of four major conferences. Over nine thousand attended the SHPE National Convention, one of the largest Hispanic conferences in STEM.

[3] NILA hosts 300 attendees: 130 student and 40 professional individual chapters every year.

[4] On average 150 attendees attend each of the seven RLDCs every year throughout the country.

programming is appealing to members as part of their membership value proposition due to its high-quality, short-term duration. In major part, this programming attributed to the large growth of SHPE membership at local chapters as well as the swell of Hispanics entering engineering over the decade [5, 6]. To organize these episodic programs, national committees, consisting of a combination of director-level oversight, staff, and subject-matter volunteer leader experts, were created. Historically, these national committees focused on a wide breadth of programming. However, given the rapid sophistication and growth of the episodic programming, the local chapter-level programming development, where most of time and development can take place from the perspective of a student member, was severely limited to the extent that member retention stagnated beyond the college experience, specifically when entering the workforce.

During the 1990's, the National Student Affairs Committee was created to focus on the chapter-based programming (which serves professionals, graduate and undergraduate students). During the mid-2000's, the National Student Affairs Committee evolved to the National Affairs Committee (NAC)[5] and oversaw three key components for the organization: (i) chapter bylaw approvals, (ii) regional leadership[6] training, and (iii) chapter development, reporting, and compliance. SHPE chapter development, reporting, and compliance started as a nationalized chapter program named, at the time, the End-of-Year Report (EOYR) program and later renamed to the National Report Program (NRP). During the development of the EOYR and early version of the NRP, participation by the chapter members in episodic programming was recorded, along with their own local activities and programs. While the in-depth functionality of these early programs was to record the chapters' performance and achieved compliance, the information was not necessarily informative to understand the conditions leading to such performance. By the late-2000's, the organization had on one hand proliferated high-value episodic event-based programming that had historically grown the membership in the 1990's for which its value saturated leading to stagnated membership growth. On the other hand, the continuous programming was in its infancy in terms of strategic paradigms towards mission-alignment and member retention. To address both limitations, the 2010's presented two major events for the NRP to evolve substantially and interweave the episodic and continuous programming into a cycle model of continuous membership development growth for the organization.

Throughout the 2010's, SHPE underwent internal infrastructure transitions, including an inter-organizational merger, to expand and better fulfill its mission. In turn, the NRP underwent two later iterations from the EOYR: one in 2014, coincident with the merger, and in 2017. The current NRP focuses on targeting chapter management and growth through a STEM workforce-preparedness pedagogical framework. The framework encompasses a cycle for continuous development and membership growth of the chapters towards measurable mission fulfillment. Moreover, the framework forms an overarching strategy towards national standardized metrics

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[5] The NAC is comprised of two SHPE servant leaders: the NAC chair and a member. The leaders are appointed by the SHPE national leaders. NAC members combined have over 30 years of SHPE experience and service.

[6] Regional leadership consists of elected representatives of the seven regions mapped across the U.S. Each region has a professional (Regional Vice President), undergraduate (Regional Student Representative), graduate student (Regional Graduate Representative), and K12 education (Regional Junior Representative) representative.

determined by the local chapter level for fund development. As a result, the NRP has evolved past its namesake of reporting and compliance to a program that teaches and provides management operations tools oriented towards members' success before and in the workforce. The Chapter Management Tool (CMT) was introduced in the third iteration of the NRP in 2017 and completing the annual cyclical structure of the NRP comprised of chapter: (i) management, (ii) assessment, and (iii) fund development. These three components are carefully organized to have their own cycles of continuous development. Thus, the program forms a contiguous system of interlocking gears with multi-faceted strategic aims. The program encompasses the features of its predecessors and enables long-term, continuous, and organic evolution of the chapters.

The objective of this work is to report on the experience and lessons learned of a decade-long transition into SHPE's hybrid continuous-episodic chapter management, growth and success program. The NRP programmatic structure serves as robust system to prepare Hispanics STEM professionals for the STEM workforce and ensure organizational mission fulfillment. Additionally, this study serves as an example of best practices for other peer chapter-based national engineering diversity organizations. The experience report is organized as follows. In Section 2, SHPE's decade-long chapter continuous programming chronology is detailed from the EOYR to NRP version 3. The program's strategic approach and corresponding required components are discussed. Participation outcomes and lessons learned from the different iterations of the programs are discussed in Section 3. An outlook on the future for the program in the upcoming decade and conclusions are detailed in Section 4 and 5, respectively.

2. SHPE's Chapter-based Continuous Programming Chronology

Over the past decade from 2010-2020, three major iterations took place for SHPE's chapter-based program. The first was in 2010 which included the merger of two programs into the NRP v.: the EOYR and blue-chip Chapter program. Afterwards, the NAC managed the program with minor intermittent revisions (e.g., shifting evaluation metrics or requirement descriptions) when needed for three years. At the end of a three-year period, the program would be assessed using a Strengths, Weakness, Opportunities, and Threats (SWOT) analysis to determine and make holistic programmatic changes [7]. The SHPE year is the June fiscal year[7]; the revisionary period took place May to June every three years. The updated program was introduced the same year at NILA in the first week of August every year. The second version of the NRP coincided with the 2014 SHPE Inc. and SHPE Foundation merger and governance structuring into SHPE. The third and current version of the NRP, NRP v.3, was created and introduced to SHPE chapters in 2017. To detail the decade-long sophistication of the SHPE's chapter-based program, the three constant major elements: (i) program requirements, (ii) chapter ecosystem integration, (iii) evaluation and feedback, will be analyzed in this chronology.

While most of the program elements in the program's evolution, chapter membership and size categorization, chapter activity/event categories and the providing of SHPE national-level awards remains constant. Table 1 shows the chapter membership categories (student and

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[7] SHPE year has four quarters each three months in duration.

professional) and their respective size categories (small, medium, and large). Student chapters are charter in affiliation with a university, college, or community college; and professional chapters with a STEM-based company or regional area (e.g., Los Angeles area). Chapter awards are determined based on overall performance in the program at the end of the SHPE year in June and provided at the SHPE Convention (or equivalent historical name), see Table 2. Below is the summary of the SHPE chapter activity categories (called SHPE Pillars) for both student and professional chapters and associated definitions:

Table 1. SHPE chapter membership categories.

Chapter Size	# Paid Student Members	# Paid Professional Members
Small	10-25	10-20
Medium	26-75	20-50
Large	75+	50+

Table 2. SHPE chapter awards and presentation event.

Chapter Award	Presented at:
Blue-chip Chapter Awards	RLDC
National Awards	SHPE Convention
Category Awards	SHPE Convention

- **Academic Development (student chapters only)**: Activities geared towards the successful graduation of members through improving or keeping high academics, involvement in advance degree-oriented opportunities (e.g., engineering science research and graduate school).
- **Career Development (professional chapters only)**: Activities geared towards the career and management development with the specific intent of upward mobility and/or advancement within the members' career.
- **Chapter Development**: Activities promoting recruitment/retention of members, promote a solid foundation for the chapter itself in terms of funding, chapter's presence and/or influence in the local community, and a unified membership.
- **Leadership Development**: Activities geared towards developing leadership skills of members, ensuring a solid foundation of leaders within the executive board and the successful transition of officers.
- **Outreach & Community Service:** Activities specifically promoting STEM awareness in the K12 community and/or supporting the local community.
- **Professional Development:** Activities geared at the soft skills and/or technical skill breadth development of the members' current workforce competencies.
- **Student/Professional Chapter Interaction (professional chapters only):** Activities promoting professional and local student SHPE chapter interaction and mentorship by the SHPE professional chapter.

2.1 Pre-2010 – EOYR and Blue-chip Chapter Program Summary

Prior the NRP in 2010, SHPE had two chapter-focused programs, namely the EOYR and blue-chip chapter program. The former was episodic in nature consisting of a 50-page report submitted to the SHPE national office once at the end of the SHPE year. The reports emulate practices in STEM industry to create a fiscal year assessment. The implied pedagogical approach is to develop student and professional chapters leaders to leverage leading SHPE chapters as a management experience. The outcomes of their business practicum would be documented in a report, also a business practice. Each report was evaluated by three SHPE professional members with the chapter is the highest average score being selected for chapter awards. The report requirements were the same as those reported for NRP v.1 in Table 3; however, EOYRs had a higher page limit. Moreover, the EOYR had an indirect assessment of individual chapter's leveraging of resources within their local ecosystem, i.e., involvement with university administration, community, local SHPE chapters, and/or corporations.

In terms of evaluation, EOYR scores were provided directly to the chapters' leader via email after the respective awards were announced at the SHPE Convention. The chapters had limited, if any, ability to make intermittent adjustments to their efforts based on the feedback. As a result, the EOYR, while capturing continuous local chapter information, operated as an episodic program. The blue-chip chapter program was the continuous programming complement to the EOYR. The program engaged chapters in a scavenger hunt-like events and activities throughout the year with a wide point system for doing the tasks typically involving operating within the SHPE ecosystem[8] of episodic programming (e.g., attending conferences). After obtaining a certain threshold of points, the chapter were classified as a blue-chip chapter[9]. Aside from this, chapters did not receive substantive guidance towards continuous improvement or alignment towards the SHPE mission. Both programs were present to the SHPE chapter leaders during NILA in the first week of August. Given the overlap of activities throughout the year and limited ability for the NAC at manage both effectively, the programs were merged into the NRP in 2010.

2.2 2010-2017 NRP v.1 and v.2
2.2.1 Requirements & Ecosystem Integration

The first two versions of the NRP retained and expanded beyond the EOYR requirements by incorporating specific requirements from the blue-chip chapter program. However, instead of one report, the NRPs collected reports throughout the SHPE year to provide at least one round of feedback. Additionally, the number of pages, 50 for the EOYR, were distributed among the reports to keep the chapter workload consistent by the end of the year. As for the EOYR, the NRP was taught to SHPE chapter leaders at NILA. NRP guidelines were provided to chapter leaders at NILA as well, however, they were not widely available to chapters that did not attend the conference. Table 3 shows the first NRP report requirements; the second NRP report had similar requirements.

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[8] Refers to SHPE national conferences and episodic programs such as scholarships and K12 programming.
[9] Blue-chip appellation implying a substantial participation/investment in the organization as is done in industry/workforce settings.

Both student professional and student chapters shared the similar requirement save for the SHPE Pillars mentioned in Section 2. As in the blue-chip chapter program, SHPE chapters reported their general information and evaluation of their events through their Continuous Feedback Forms (CFFs) in the NRPs. CFFs were one-page event summaries were chapters self-evaluated a subset of their events displaying: (i) alignment with their goals, (ii) outcomes, and (iii) future events within a SHPE pillar. Table 4 shows the number of CFFs required per report based on the chapter size category, see Table 1. However, within the NRPs, as in the EOYRs, the CFFs were misnomers given the delayed feedback turnaround in the evaluation process. Thus, their usage was implemented within the CMT in NRP v.3 were feedback could be provided periodically throughout the year by elected SHPE regional leadership.

NRP v.2 requirements were those of NRP v.1 with the changes aimed at streamlining student and professional requirements into one set to be applied broadband to all chapters. NRP v.1 required three reports for students each with different requirements for each report. NRP v.2 streamlined these efforts with to two reports with the same requirements for student and professional chapters with specific differences only in select sections. A single template was provided to chapters to be used in both reports. These changes, while small, increased the user experience for the chapters as well as for the NAC to create and evaluate the reports, respectively. Moreover, the template guided chapters and ensured report uniformity.

NRP requirements have inherent, direct SHPE ecosystem participation requirements with corresponding evaluation. The requirements were selected to maximize participation in SHPE episodic programming (conferences and scholarships) as well as incentivize communication with SHPE regional leadership. However, such reported information would be data SHPE national had internally with higher fidelity. Additionally, limited to no gain could be determined or measured from aligning the chapters within the SHPE leadership infrastructure. Finally, the reports were SHPE ecosystem-focused and did not directly incorporate or incentivize incorporating the chapters local ecosystem of resources, allies, and/or advocates. Thus, the NAC, and SHPE at a national leadership level, did not have information as to the current state of the chapter. SHPE chapters, as well, were missing the important guidance directly or indirectly of using their ecosystem towards their members' success. NRP v.3 addresses the NRP v.2 limitations with the addition of the CMT.

2.2.1 Evaluation and Feedback

Table 5 shows the number of points and submission deadlines per report for both student and professional chapters based on the requirements listed in Table 3. For brevity, the requirements for NRP v.1 Report 1 are omitted and are a subset of those in Table 3. For NRP v.1, student and professional chapters submitted their first reports at the end of the previous SHPE year. Student chapters the submitted at the mid-point of the SHPE year and their third report on April 15th. Professional chapters submitted their summary report in a similar fashion as the EOYR near the end of the SHPE year on May 15th. Given the shifted deadlines and transition from the EOYR, participation in the NRP v.1 was limited at first, however, it soon rose with NRP v.2 having

Table 1. NRP v.1 student report 2 requirements.

Item	Points Possible	Comments
Cover Letter	5	Brief letter submitting report to SHPE
Chapter Contact Info	10	Information is on SHPE national server
Chapter Executive Board Info	10	Information is on SHPE national server
Chapter History	10	Brief summary of the chapter's history
NILA Attendees indicated in Board Info	10	Indicate any NILA attendees from the previous year and their current role
Chapter History	10	Brief summary of the chapter's history
Calendar of Events – Fall	40	Events from July 1st-December 31st
Prior Year Business Analysis	80	In Depth business analysis of last year
Chapter Goals/Objectives	150	Must follow SMART Objectives format and align with SHPE National's overall goals.
SHPE Quarter - Chapter Development	25	At least one Chapter Development event in August, September or October
SHPE Quarter – Academic Development	25(35)	At least one Academic Development event in August through December(An additional 10 points for adding a Graduate School Information Session)
SHPE Jr. Progress/Event	20	1 page describing SHPE Jr. Initiatives
SHPE Core Program Participation	25	Participation in one SHPE National Core Program
Continuous Feedback Forms (CFFs)	200	Events from July 1st-December 31st
Mid-Year Goal Progression	125	Must follow SMART goals evaluation form (in appendix)
Support Needed/Lessons Learned	10	Communicate issues and lessons learned to SHPE National
Chapter Brochure*	20	Must be attached with the report in the appendix
Display Board*	20	Image must be attached with the report in the appendix
Chapter Website*	20	Must be a working link and current. Attached in Appendix
Fall Conference Calls*	30	Participation in Regional calls
Regional Event Attendance*	20	Chapter members attend RLDC
SHPE Conference Attendance*	25	Chapter members attend the SHPE Conference
SHPE Magazine Submission*	10	Fall Edition: SHPE Conference version. Confirm article space by: first week of September for fall issue; first week of November for Winter issue
Total	**900**	

streamlined requirements and deadlines. Two reports for both student and professional chapters and close deadlines led to increased participation and quality in the reports.

As in the EOYR, the feedback was provided to the SHPE chapters via email from the NAC, however, it was now provided within the SHPE year. The feedback was emailed directly to the chapter leader to then deliberate the evaluation and feedback with their respective chapter

Table 4. NRP v.1 and v.2 CFF requirements.

NRP Item	Number of CFFs required per SHPE Pillar	Number of CFFs required per report
Small Chapters (10-25)	1	5
Medium Chapters (26-75)	2	10
Large Chapters (75+)	3	15

Table 5. NRP v.1 points and submission dates per report items in Table 3.

Students				Professionals		
NRP Item	**Points Possible**	**Submission Date**		**NRP Item**	**Points Possible**	**Submission Date**
Report 1	300	June 30th		Report 1	900	June 30th
Report 2	600	January 1st		Report 2	900	May 15th
Report 3	900	April 15th		Total	1800	
Total	1800					

membership. However, there was no verification to SHPE national leadership as to the extent to which chapter leaders conducted such an activity. Moreover, chapters had no access to other chapters' report, evaluation and/or feedback to learn best practices. The streamlining from NRP v.1 to v.2 eased the NAC's ability to provide quality feedback in a timely fashion. However, the reporting elements that needed continuous feedback, namely the CFFs, was received after the fact such that chapters' leadership would transition without the lessons learned being inculcated and stymied chapters' growth.

2.3 2017-2020 NRP v.3
2.3.1 NRP v.3 Program Requirements
After the three-year duration of NRP v.2, the NAC conducted a holistic evaluation period of the NRP through a SWOT analysis in June of 2016. The two-report system was a valuable strength within the program as it allowed for mid-year and end of the year evaluation akin to the EOYR. However, keeping the reporting deadlines aligned for both student and professional chapters was identified as a needed opportunity and change. The length and specific requirements of the reports remained numerous and, while they ensured compliance within the SHPE ecosystem, added limited reciprocal value to either the chapter or SHPE national leaders. No participation in SHPE chapter's growth was requested, even indirectly, by the chapter advocates and allies and was, thus, unknown. The evaluation system was fruitful for the chapters that communicated through their reports; however, its reach was limited to previous chapter leaders. As a result, the reports and feedback were treated as exam-like constructs under a fixed mindset by the chapters and not shared for best practices. Finally, the CFFs components, while purposeful, were improperly implemented within the EOYR and NRP's episodic-oriented components, namely the reports. Thus, during the revision of the NRP, SHPE national leadership provided the NAC the

opportunity to overhaul the program's design but constrained to having measurable outcomes and alignment towards SHPE's mission. The addressable threat for the NAC was that the significant changes to the NRP would lead to a lack of participation by the chapters. However, the NRP was integrated into the SHPE year via NILA to mitigate such an outcome.

NRP v.3 has chapter-centered programming towards SHPE mission fulfillment as its underlining theme. One of the main lessons from the holistic SWOT NRP analysis was that separation and complementary nature of continuous and episodic needs of chapters and SHPE within the NRP. The continuous development components of the predecessor programs, e.g., the CFFs, needed to be expanded as part of mission alignment, objective creation, event management with feedback and growth being the focus and not evaluation (grading). The full-continuous programming component, called the Chapter Management Tool (CMT), would form one gear of a three-gear hybrid continuous-episodic program. The CMT is discussed further in Section 2.3.2. The pseudo-continuous-episodic component are the assessment reports (NRP reports) that would serve as milestone summaries for chapters of their accomplishments for the first and second half of the SHPE cycle. The final gear supports and guides chapters on a matter left to chapters to determine for themselves: fund development. However, a common thread from the earlier NRP versions presented to the NAC via the reports was lack of knowledge on how to ascertain funds to support the chapter. Thus, the Chapter Sponsorship Brochure (CSB) provides a sponsorship brochure template manner consistent with the framework of the CMT and NRP reports. Below is a full summary of the NRP v.3 components noting how the NRP expanded past its namesake for reporting to a cycle-based, chapter-centered, growth mindset-oriented development program [8].

Summary of the NRP v.3 components

1. *Chapter Management Tool (CMT):* a comprehensive chapter management and improvement tool consisting of a Chapter Plan is required by the chapters towards organizing their events and programs with continuous feedback from regional leaders and the NRP Reports;
2. *Chapter Assessment Reports (i.e., NRP Reports 1 & 2):* two comprehensive NRP reports documenting the chapter's events, programs, and ability to further the SHPE mission and vision. The reports are be used to assess the chapters areas for growth and strength and making award determinations; and
3. *Chapter Sponsorship Brochure (CSB):* a chapter fund development template that is consistent with the CMT and NRP Reports for chapters to use to secure funds.

Table 6 shows the NRP report requirements for NRP v.3. Unlike its predecessors, the NRP v.3 requirements are minimal recording the most valuable information to ensure full use of the chapters' ecosystem with SHPE national support as an equal partner. Reducing the NRP v.2 requirements to two pages, the chapters provide their accomplishments and supporting quantifiable evidence. Support needed and lessons learned encouraged chapter leaders to reflect on their performance based on the results of the previous two pages in the report. Fig. 3 shows the continuous cycle guiding chapters on how to reflect on their outcomes in terms of (i) value provided to members, (ii) how the value was implemented, (iii) how the values was evaluated. This reflective continuous-development cycle framework educated chapters on a growth mindset towards continuous development and growth [8]. Moreover, it provided chapters the ability to

Table 6. NRP v.3 report requirements. Same requirements for both reports and both student and professional chapters.

Item	Points Possible	Comments
Cover Page	0	One (1) page max with chapter contact Info
Chapter Accomplishments	3	One (1) page max; summarizing annual chapter's activity and accomplishments
Chapter By-the-numbers	3	One (1) page max; summarizing the chapter's numerical accomplishments
Support Needed & Lessons Learned	3	One (1) page max; communicate issues and lessons learned to SHPE National
1st letter of recommendation	3	One (1) page max – See NRP Template for specific requirements
2nd letter of recommendation	3	One (1) page max – See NRP Template for specific requirements
SHPE Award Self-nomination	0	Max one (1) page for self-nomination for SHPE Chapter Awards. Maximum three nominations.
Total	**15**	

connect with SHPE national leaders to request for support and resources where needed to improve the chapter. Letters of recommendation requirements were introduced in NRP v.3. These letters are to be written by specific advocates (e.g., student chapter advisors[10]), allies (e.g., engineering dean, company leaders and sponsoring representatives), and the community (e.g., K12 teachers, community center leadership, etc.). The purpose of the letters was three-fold as they: (i) ensured at least a one-time connection between SHPE chapters and their local partners, (ii) incentivized allies and advocates to be proactive and knowledgeable about the SHPE chapter, and (iii) enabled SHPE national leadership the ability to monitor if SHPE chapters were receiving the necessary support. The latter was a critical element not captured by previous iterations of the program. Lastly, the NAC applied the growth mindset approach to all aspects of the program including awards selection. In previous NRP versions, the chapters with the highest awards were selected for as national chapter awards[11]. The nomination process was based on the evaluators as well as the NAC's assessment with no input from chapters themselves. As a result, the NAC shifted the paradigm and instead encourage chapters to self-nominate for specific chapter awards[12]. By shifting the process into a requirement, the chapters would increase their self-efficacy [9] and validate their efforts and accomplishment in realizing the SHPE mission. Finally, it is noted that the NRP guidelines, detailing the requirements, were streamlined to be less than twelve pages compared to the 20+ page documents of their predecessors.

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[10] For student chapters, an advisor is either a faculty member or university administrator.
[11] The NAC provides up to 31 different awards to chapters based on their NRP performance across the student and professional chapters annually.
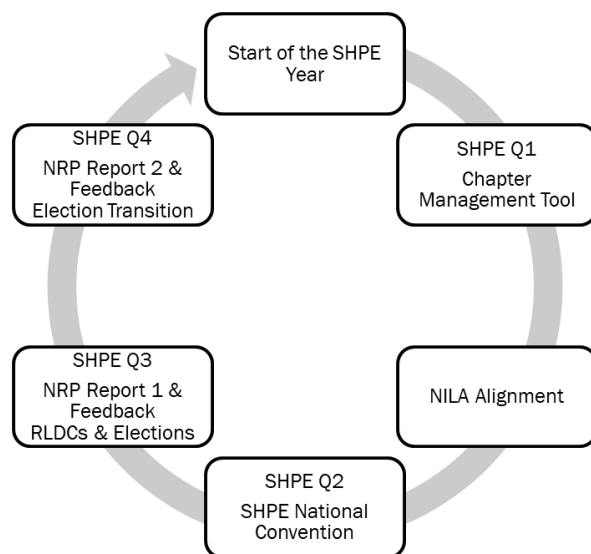[12] Up to three different chapter awards for NRP v.3.

Figure 1. NRP v.3's chapter activity in the SHPE annual cycle.

2.3.2 Chapter v.3 Ecosystem Integration

In addition to chapter ecosystem integration within the NRP v.3 report requirements, the NRP v.3 components were integrated into SHPE's episodic event-based ecosystem in an annual cyclical fashion. Fig. 1 shows the annual SHPE episodic programming cycle in the form of a cycle with the NRP programming components at within the SHPE quarters. After the start of the SHPE year, the incoming chapters leadership use previous NRP reports and feedback to populate their CMT. After drafting the chapter plan in the CMT, see Fig. 2, the chapter leaders attend NILA for coordination and alignment with SHPE national and regional leadership. By the end of the NILA, the chapter leaders increased their leadership self-efficacy and have a completed annual member success-oriented chapter plan aligned with the mission and SHPE leadership efforts [10]. Throughout the first and second SHPE quarter, the chapters host their activities and attend the SHPE convention. At the start of the third SHPE quarter, the chapter submit the first NRP report detailing their accomplishments, feedback, and support from allies from the first half of the SHPE year. In the third quarter, RLDCs and both national and chapter elections are held throughout the organization. The second NRP reports are submitted, chapter leader transitions take place, and the first part CMTs are developed by the end of the fourth quarter. As the cycle repeats, chapters utilize the feedback and best practices from previous years and from all chapters, see Section 2.3.3.

The CMT has a cycle of continuous development of its own consistent of several programming elements from the EOYR and previous NRP versions. A CMT template is an excel sheet with three tabs made publicly available to the chapters[13]: (i) chapter information, (ii) SWOT analysis, and (iii) chapter plan. The reflection cycle detailed in Section 2.3.1, see Fig. 3, for the lessons learned and support needed is used in the SWOT analysis. Fig. 2 shows the components

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[13] An instructions README page is also provided detailing how to complete the document and submission information for feedback.
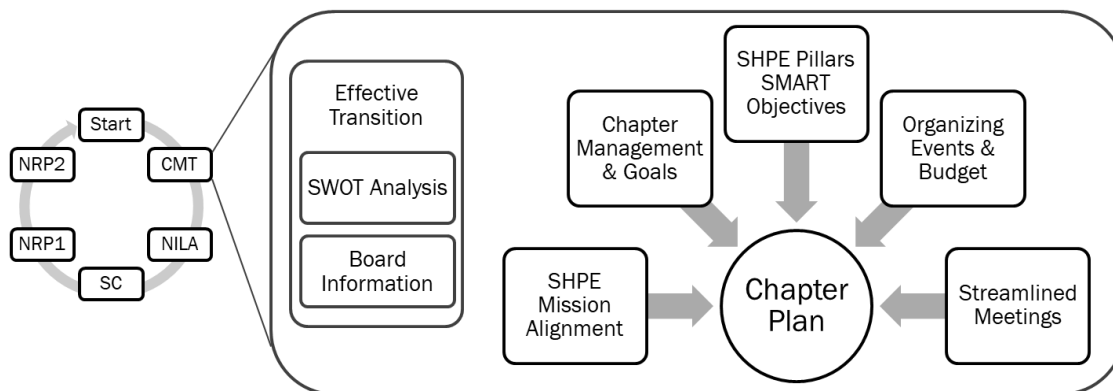
Figure 2. NRP v.3 CMT components and theory.

within the chapter plan. The chapter plan is a management-level framework of hierarchical cascade-like constructs. That is, chapters are guided to accomplish the SHPE mission at a local level through three main goals: (i) recruit, and (ii) retain members, (iii) towards their successful post-graduation (students) or career-upward mobility (professionals) transition into the STEM workforce. Within each of these three goals, chapters leaders create Specific, Measurable, Attainable, Relevant, and Timely (SMART) objectives (typically, two to three) focused on one of the SHPE pillars (see Section 2) [11]. Chapter leaders complete their SMART objectives via focused events and programs connected to budgetary line items. As a result, the CMT provides chapter leaders a multi-temporal scale and multi-management level, i.e., bird's eye to granular-level, strategic to operational, respectively, view of the chapters' activities. When creating the CMT and launching NRP v.3, the NAC provided chapter leaders guidance and alignment sessions with SHPE national leaders early in the SHPE annual cycle via NILA.

Prior to NRP v.3, NILA's curriculum consisted of workshops focusing on workforce development skill sets, leadership skill practicum in the form of case study, and seminars on leadership in the STEM workforce. In addition to leading NILA's curriculum transition to literature-based socio-cognitive leadership self-efficacy model of McCormick, the NAC incorporated and expanded existing sessions focusing on chapter development and SHPE mission alignment in NILA 2017 [12, 10]. NILA's curriculum has pre-conference webinars educating chapter leaders on the NRP and prepares them to complete the CMT prior to attending the conference. During NILA, regional and chapter leaders have an at least one-hour learning session every evening of the conference to discuss the CMT with chapters. By the end of NILA, the chapters and their leaders have a developed and aligned plan to implement throughout the year. Since the SHPE Convention focuses on workforce development limited integration currently takes place but is an area of future growth. RLDCs' curriculum have been undergoing development and will be focusing on the CMT transition in the future, see Section 4 for more details.
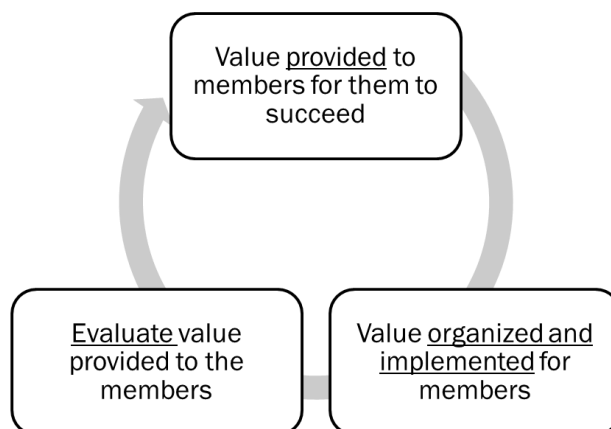
Figure 3. Continuous value development cycle for CMT SWOT analysis and NRP lessons learned and support needed NRP report requirements.

Table 7. NRP components submission and feedback due dates.

NRP Item	Submission Due Date	Feedback Due Date
CMT	September 15th	October 1st
NRP1	January 15th	March15th or RLDC
NRP2	June 15th	July 15th

2.3.3 NRP v.3 Evaluation and Feedback

The exam-like, competition construct and appeal of previous EOYR and NRP versions was changed with NRP v.3. Keeping with the growth-mindset, chapter-oriented approach, the NAC decided broadband distribution of NRP reports and evaluation enabled the sharing of best practices. Instead of chapters submitting reports via a portable document format (.pdf), the chapter now provide a link to the document that they own on their local chapter data management infrastructure. The NAC then hosts a publicly available spreadsheet for the SHPE chapters to view their CMTs, NRP reports, respective evaluation (score) and feedback of current and previous years for all chapters. Three years of the reports are retained within the document for chapters to access previous reports. Additionally, over ten years of chapter awards is listed in the document.

The NRP was also streamlined for the distribution of evaluation and feedback. Table 7 shows updated due dates and dates by which the NAC and SHPE professionals provide feedback to the chapters. In comparison with Table 5, the streamlining for both student and professional chapters is evident. Additionally, the grading system was changed to be favor a more objective scoring and rubric by keeping all components of equal weight within the report, see Table 6. The NRP guidelines provide a grading rubric for each of the NRP requirements ranging on a scale from zero to three. Three maximum points signifying exemplary effort and best practice by the chapter and zero no submission provided. NRP report evaluators are educated on the program's guidelines and report evaluation rubric to limit subjective grading[14]. The determination of awards is based on a combination of the highest score and self-nomination that chapters provide within their report.

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[14] NRP evaluators consist of the NAC and regional leaders, 30 evaluators total.

This framework enables chapters to take further ownership of the NRP components as these tools were first developed by the strongest chapters. Moreover, the framework allows for the NRP reports to continue to converge towards a national standard of metrics for nationalized data-driven approaches in which SHPE chapters realize the SHPE mission.

3. Lessons Learned

The implementation of NRP v.3 provided several lessons learned on: (i) growth mindset-oriented ecosystem-aware, (ii) hybridization of episodic and continuous, and (iii) broadband distribution of evaluation and feedback chapter programming. The growth mindset-oriented and ecosystem-aware programming quickly gained traction with the chapters as it involved several previously communities of allies, namely chapter advisors, to participate in this process. National standards as part of the chapter by-the-numbers requirements, as applied in NRP v.1, were avoided and will arise natural over the coming years. Additionally, the letters of recommendation served as measurable evidence as to whether the chapter was being supported by the university (student chapters) or company (professional chapters). This information, in turn, was available to regional leaders to take measurable action to support the chapter in a focused manner. The incorporation of the NRP as hybrid continuous- episodic program throughout SHPE annual cycle clarified chapters expectations and understanding of SHPE as an organization. Prior programs perpetuated the understanding of the program an exam-like, competition construct within SHPE as a workforce development only organization. The shift of mindset within NRP changed chapters' view of the program and the organization. However, more guidance should be provided to writers of the letters of recommendations, in addition to what is provided in the template and webinars, regarding the information requested from them.

The CMT was constructed based on the best practices from SHPE chapters and enabled hybrid continuous-episodic development of the program. The NAC continues to follow this practice to learn how to further improve the tool from year to year. Additionally, the CMT enables the NAC to learn how chapters grow from small to large chapters and develop models for sustained chapter growth given their ecosystem of resources and allies. The CFFs components of the EOYR and previous NRP versions were retained within the CMT, however, it remains to be measured the extent to which chapters utilize this as part of their transition and development. Further research and education will be provided to regional leaders to proactively use these sections to provide chapter support and development. The broadband distribution also gained traction with chapters; however, the NAC is learning on how to measure the extent to which SHPE chapters use the portal towards developing best practices. Given the evolving nature of the organization during the last decade, most of these tools were developed with Google's documentation ecosystem. The future data management system will keep current functionality and ability for chapter growth model development and validation.
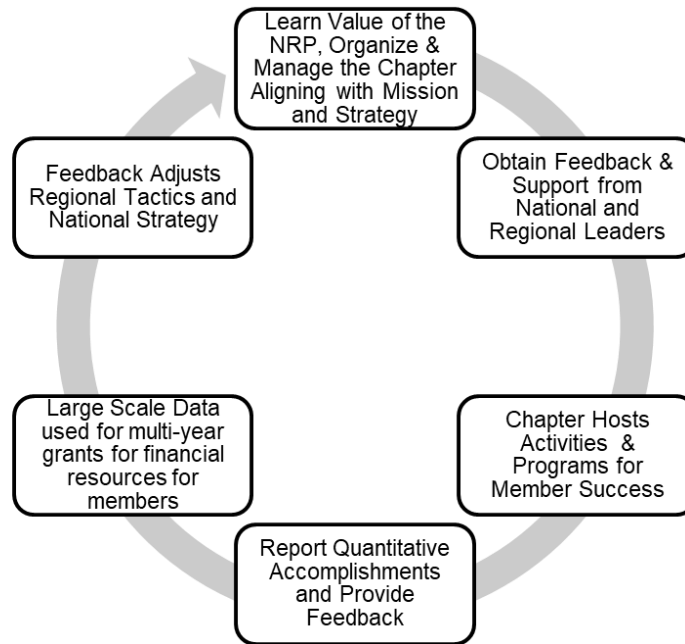
Figure 4. Strategic continuous development cycle of the NRP towards SHPE mission fulfillment.

4. Outlook

Since the implementation of the NRP v.3, SHPE and its NAC presented chapters with the higher-level aim of the program leading national standards. The evidence-based standards would then enable SHPE to use these strategies for fund development purposes, see Figure 4. In addition to the improvements to the granular educational elements (e.g., improving letters of recommendation), the program has begun its full integration with the SHPE staff for management purposes. As a result, dedicated SHPE staff will eventually manage the NRP towards national standards and integration with the remaining episodic programming. The program will be recognized as a programming centerpiece alongside other national programming (e.g., SHPE Convention, etc.) on its website platform. Additionally, broadband data will become available to STEM and engineering education researchers to continue to identify trends among Hispanic Serving Institutions (HSIs) [13] as well as non-HSIs. Moreover, the qualitative and quantitative data will assist adapting existing theories, such as cultural capital building [14], to develop models on chapter growth and self-efficacy studies of Hispanic students and professionals in the workforce. Such models, frameworks, and tools from the NRP would be invaluable for STEM diversity organizations and Diversity, Equity and Inclusion (DE&I) STEM efforts at universities and in the workforce.

5. Conclusions

A decade-long experience report of SHPE's chapter management program's sophistication from a broadband set of requirements for compliance to a cyclical ecosystem-integrated approach to continuous development is presented. Three major facets of these chapter-based programs are

considered throughout the two iterations of the program from the EOYR to the NRP v.3: (i) program requirements, (ii) ecosystem integration, (iii) evaluation and feedback. Including NRP v.2, these components were streamlined via a holistic SWOT analysis towards developing NRP v.3. NRP v.3 was designed to contain multiscale continuous development cycles throughout its requirements, integration, and feedback components towards SHPE mission fulfilment. Significant lessons learned through this decade-long process include, but are not limited to, (i) using three-year periods to assess the strengths and weakness of the program, (ii) integrating the program within the full organization's episodic programming, and (iii) enabling broadband-level access of reporting outcomes to share best practices as a community. Future iterations of NRP will continue to build on these best practices towards combining the results with community wealth building models for DEI efforts and furthering Hispanic success in the STEM workforce.

Acknowledgments

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