

# Biomedical Engineering Society

# Chapter Development Report

PINE VIEW CAMPUS: 1 PYTHON PATH, OSPREY, FL, 34229

941-486-2001

2022

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# **RENEWAL DOCUMENT**

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# I. PINE VIEW SCHOOL BIOMEDICAL ENGINEERING SOCIETY CHAPTER DEVELOPMENT REPORT

#### August 2021 - May 2022

PINE VIEW CAMPUS: 1 PYTHON PATH, OSPREY, FL 34229 941 - 486 - 2001

#### **Corresponding Authors:**

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Executive Summary: The Pine View BMES chapter strives to exemplify a committed and informed biomedical engineering community. We aim to share knowledge and create new experiences for every student who is interested in biomedical science. The Pine View BMES chapter meets at I P.M. in the faculty advisor's room every Tuesday. During the 2021-2022 academic year, our chapter researched plant decellularization and experimented with various plant tissues. Students worked to determine the best plant tissue that could be used as a scaffold to grow bone tissue. The chapter has taken root and expanded through outreach activities ranging from volunteer work, to club fairs and classroom presentations, to local professional health events. Our meeting with Florida Gulf Coast University facilitated the plant decellularization project as members had the chance to better understand tissue scaffolding. Over the year, the Pine View BMES chapter planned mentoring activities through the Suncoast Science Center and our own BMES meetings. During the meetings, members of our chapter learned how to contact professionals, create informative BMES posters, make scientific diagrams, and more. As we move forward, the Pine View BMES chapter intends to continue creating an environment dedicated to biomedical engineering.

# II. COVER LETTER

#### Dear National BMES:

During our third year as a high school chapter of the Biomedical Engineering Society, Pine View BMES' goal was to foster interest in biomedical engineering through educational and social engagement opportunities for students. We began the year with eight returning members from the previous school year. They worked to gain new members and introduce interested students to the club and the field of biomedical engineering. Students began investigating various areas of interest within the field and provided club members with the opportunity to explore areas of interest. Students were able to research and discuss recent developments in the biomedical field. The club grew to consist of 23 members with an elected executive board. Social, mentor, and outreach committees were formed and assigned appropriate projects. Our chapter met weekly and accomplished several activities, including social activities, community volunteering and scientific research.

Members of our club collaborated this year on a research project investigating the effectiveness of decellurization on various plant tissues. Students were effectively able to complete the decellularization of lettuce leaves and various other plant tissues. With multiple plant tissues decellularized, students compared results and determined green lettuce to be the plant tissue that produced the most successful decellularized results. Students also explored biomedical engineering beyond the group research project by learning various life skills such as investigating career areas within biomedical sciences and how to conduct individual research.

The organization has continued this year in its involvement in the local community. Multiple BMES members volunteered at youth science organizations, such as STEM Saturdays and the FAB Lab. Furthermore, Members were also involved in this year's Sarasota Blood Drive.to construct masks for local organizations.

For the upcoming 2022-2023 academic year, Pine View BMES is looking forward to finishing its current projects and increasing its visibility among high school, middle school, and elementary school students. We plan to expand fundraising efforts beyond campus and increase our presence in the local community. Pine View BMES members are committed to the growth of the chapter, continuing research and eager to promote interest in the field to their peers.

Sincerely,

Ray Min, Sonica Prakash Ray Mín, Soníca Prakash

PV BMES Co-Presidents pvbmes@gmail.com Rebecca Kehler

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## IV. ADMINISTRATIVE REPORT

The Pine View School Biomedical Engineering Society, formed in 2019, was the second high school in the nation to have a high-school BMES chapter. Our current executive board has the president, the vice president, the treasurer, and the secretary, which are democratically elected at the end of each school year. We have continued our social, mentoring, event planning, and outreach committees from last year, which were able to expand our scope and reach out to more people. This year, our club grew to include an unprecedented and unexpected number of members. However, we were excited by all the new students who were interested in biomedical engineering. Our committees met weekly and were open to all, which increased involvement as well as retention of general members. Meeting agendas are shared a day prior to the meetings, so that all members are aware of what the plans are before they enter the room. The meeting agendas are also saved for future reference to make sure we know what tasks have already been taken. Meeting minutes are also written by the secretary, so that we can compare our goals and how many of them that we accomplished.

#### Faculty Advisor, Ms. Becky Kehler, rebecca.kehler@sarasotacountyschools.net

#### **President**, Ray Min and Sonica Prakash, <u>pvsbmes@gmail.com</u>

As the President, of the organization, in charge of overseeing all operations, maintaining relations with the PVS Bioengineering Faculty Advisors, corresponding with other chapters of BMES, presiding over all meetings, and managing the overall direction of the org. Also networking with other BMES student chapters and other organizations and bringing professional and career development opportunities to members.

#### Vice President, Krystal Tran

Responsible for membership logistics, facilitating communication between the officers and members, keeping administrative tabs on the officer board, and ensuring overall member engagement.

#### **Treasurer**, Jack Suchora

In charge of managing all PVBMES funds, allocating money to the committee chairs, applying for external sources of funding, and contacting potential sponsors.

#### Secretary, Arya Doshi

Ensure meetings are effectively organized and minute. Maintain effective records and administration. Uphold the requirements of research documents, charity policy, event policy. Communication and correspondence.

## **PVSBMES**

Meeting Minutes Example

11/21/22 Meeting Minutes

#### Announcements

• Membership Dues (\$30 per person)

#### **Discussion of Research**

- Research Question: Which plant tissue can be decellularized to produce the most effective scaffold for bone tissue?
- Brainstorm which areas of a spinach leaf would be most effective at holding cells
  - Have students create diagrams of decellularization

#### Direction of the Project: Furthering research

Gist of things: have students find research articles that investigate the decellularization of various plant tissues

- Cucumbers
  - Decellularization has been completed before in various research articles
- Apples
  - o Porous material allows for more cells to settle onto the scaffold
- Green Lettuce
  - Easily accessible everywhere
  - Both the stalk and the leaf can be decellularized to determine which part of the plant tissue is most effective at being decellularized
- Spinach
  - Contain a network of vessels that would be easy for cells to enter through

#### To-do Overbreak

- Find databases regarding data
- Fundraising CDR paragraph

# V. TREASURY REPORT

To earn the funds necessary to complete our experiment, the Pine View Biomedical Engineering Society raised money through various methods. These methods were purposed for raising money and also challenged the creativity and intuition of students while providing them plenty of fun. For example, we hosted PVBMES's annual "Pull the Ribbon and Get the Prize" booth and the fundraising event, the Pine View Fair. The booth taught members important skills such as responsibly managing time and money. Furthermore, the members enjoyed the making of the booth and brainstorming ideas together. Overall, the booth was simple, easy to run, and encouraged students to problem-solve on the spot. At the Pine View Fair, \$350 was made from this booth. In addition to our chapter's booth at the Pine View Fair, our chapter also requested money from the Pine View Association. A PowerPoint was made, and the public speaking skills of students were put to the test as they presented in front of a panel of adults and potential sponsors. As a result of their efforts and convincing presentation, the chapter was able to raise \$1800. The funds earned enabled the chapter to purchase the necessary materials for the plant decellularization project.



| Balance          | QI    | Q2    | Q3      | Q4     |
|------------------|-------|-------|---------|--------|
| Summary          |       |       |         |        |
| Starting Balance | \$151 | \$106 | \$366   | \$1116 |
| Credit           | \$0   | \$350 | \$1800  | -\$100 |
| Debit            | -\$45 | -\$90 | -\$1050 | \$1016 |
| Final Balance    | \$106 | \$366 | \$1116  | \$1016 |

## VI. CHAPTER ACTIVITIES

Overall, our chapter has been able to complete several activities during this past year. Our club was able to participate in many activities not only throughout the community but organized by the club as well. For example, many members had the opportunity to volunteer at the Faulhaber Fab Lab in a variety of their events as well as at local hospitals throughout Sarasota County. The biggest focus of many of our meetings was our plant decellularization project to determine the best plant tissue that could be used as a scaffold to grow bone tissue. With this project, students made diagrams to demonstrate their understanding of the process. Furthermore, students were successfully able to decellularize various plant tissues, including green lettuce, spinach, cucumber, and apples. Students also participated in other club activities such as career-poster making, meetings with research professors and doctors, interest projects, and outreach to other grade levels. To raise money for these activities, the chapter applied for funding from non-profit organizations and fund-raised through a booth at the Pine View Fair.



# VII.SOCIAL ACTIVITIES

The Pine View BMES Chapter was able to maintain social activities throughout the school year. Throughout the year, we regularly had introductory meetings that welcomed new members and caught them up with our current projects. These meetings helped to create an environment that embraced new students that had innovative ideas. Furthermore, students were able to present their own interest projects to promote bonding through different topics that students were enthusiastic about. Throughout the school year, members were also part of other bonding activities such as seasonal parties and elections. These activities united students beyond the group research project. Lastly, students were involved with shared activities outside of the chapter as well. These shared activities helped to foster a network beyond the Pine View BMES Chapter.

| Activity                                     | Dates                             | Description   | Attendance  |
|--|-----------------------------------|---|-------------|
| Speech and Debate                            | Weekly, August 2021 -<br>May 2022 | Club members utilized<br>public speaking skills to<br>advocate for solutions<br>for real-world<br>problems.   | 4 Members   |
| Winter Party                                 | Weekly, August 2020 -<br>May 2021 | Snacks were brought in<br>and students socialized<br>with one another<br>before the winter<br>break.  | 8 Members   |
| Fab Lab Volunteering                         | Weekly, August 2021 -<br>May 2022 | Club members met<br>with other students<br>around the Sarasota<br>County to promote<br>interest in science with<br>a local non-profit<br>organization | 4 Members   |
| Individual Research<br>Project Presentations | April 2021                        | Club members<br>presented topics that<br>interested in them to<br>promote enthusiasm<br>for science.  | All Members |
| Elections                                    | May 17, 2021                      | Club members elected<br>officers for the 2022-23<br>school year.  | All Members |
| Weekly Meetings                              | Weekly, August 2021 -<br>May 2022 | Club members met<br>regularly to research<br>glyphosate and share<br>ideas pertaining to<br>biomedical engineering                                    | All Members |

## Speech and Debate Successes



## Fab Lab Volunteering



Slide from a Student Presentation on Brachyspira



Officer Elections



## VIII. INTERCHAPTER ACTIVITIES

Because of the aftermath of the pandemic, it was hard for us to interact with other chapters in person. This led to us only being able to meet fewer chapters than usual. Officers have contacted other Universities through emails so the club could have sustained zoom calls. This allows members to better understand the industry since this is not normally exposed during school times. The inter-chapter activities allowed us to continue our projects and investigate professionals about subjects that we were interested in including tissue scaffolding with the Florida Gulf Coast University. Our meeting with the Florida Gulf Coast University enabled interaction with university students of biomedical engineering and sparked novel approaches to our own plant decellularization project. We also have interacted with the University of Los Angeles Biomedical Engineering Club, but these plans were cut short. In future years, we plan to meet other chapters, across Florida, in person.

#### Dr. Liao, Florida Gulf Coast University Biomedical Engineering Meeting 1/25/22, 14 members

#### Cost = \$0

Students interacted with professionals from Florida Gulf Coast University. Over the course of the meeting, FGCU professors and students studying biomedical engineering explained different methods of scaffolding and explored ways to synthetically replicate cellular materials using polymers. These polymers can be made using various types of machines and techniques, many of which were explained. Pine View BMES got the chance to present its own projects, as well as answer questions from the professors.



Participants were constantly engaged in asking questions. Since decellularization projects have been one of the club's main focuses this year, having the opportunity to collaborate with experts on current research was extremely insightful. Hearing others with prominent levels of knowledge regarding biomedical engineering was useful in gaining a better understanding of how to carry out decellularization and recellularization projects. More importantly, the discussion provided inspiration for future developments and the next steps in the club's decellularization projects, which will hopefully be further explored in future years.

# IX. OUTREACH

The PVBMES chapter strives to improve and increase their own and others' knowledge of STEM. Due to COVID-19, outreach during this past year has been limited, but achieved. This year, the club has recruited several new high school members, ranging from grades 9 to grade 12. Furthermore, the club has organized stem meetings with middle school students to teach topics in biomedical engineering. Lastly, the club has spread information by doing volunteer work at Sarasota Memorial Hospital, blood drives, and the Sarasota Fab Lab.

I. Volunteering at Sarasota Memorial Hospital:

Sarasota Memorial Hospital's Teen Volunteer program provides numerous ways for teens to gain experience in a healthcare setting. Volunteers perform various tasks with compassion, care, and support to the hospital's patients, staff, and visitors. Tasks such as blood bag deliveries, meal trays, specimen deliveries, and patient care are completed. To be better involved in our community, club members took the initiative to use the volunteer community at SMH as an outlet to spread information about the PVBMES chapter. Individual members of the club have shared their experience and provided information about the purpose and goal of the club, and how to join. Due to this, our club managed to garner interest for STEM to our peers outside of Pine View. Members of the PVBMES club have volunteered at the hospital for a total of over 250 hours.

| Sarasota Memorial Hospital | August 30th, 2021- May 28th, | 3 BMES members |
|----------------------------|------------------------------|----------------|
| Teen Volunteer Program     | 2022                         |                |
|                            | Sarasota, Florida            |                |

Audience: High School Students

2. Organization of Blood Drive:

The Suncoast Blood Bank hosts numerous blood drives throughout the year. Volunteers are expected to schedule appointments, transport donated blood, do data entry, and prepare

marketing materials. Aiding in the organization of the blood drive provides members of the PVBMES club with opportunities to educate others about the club.

| Suncoast Blood Bank Blood | May 17th, 2022    | 3 BMES members |
|---------------------------|-------------------|----------------|
| Drive                     | Sarasota, Florida |                |

Audience: High School Students

3. Middle School Biomedical Engineering Presentation

BMES members met with students of a life science class and led a DNA-building activity. The middle school students were instructed about the function of DNA and DNA replication processes. In order to make a connection back to biomedical engineering, gene splicing was also introduced. The middle school students were provided with materials to make a DNA model using fun materials including Twizzlers and marshmallow. As a result of this interaction, enthusiasm for biomedical engineering amongst lower grade levels increased.

| Middle School Life Science | April 14, 2022    | 6 BMES members, 17 middle |
|----------------------------|-------------------|---------------------------|
| Presentation               | Sarasota, Florida | school students           |

#### **Blood Drive Poster**



## Middle School Life Science Presentation









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# X. MENTORING

This year, the PVBMES club organized mentoring activities through the Suncoast Science Center and to fellow BMES student members. Our chapter aims to increase communication with others to inform them on the STEM topics related to biomedical research. Throughout the entire school year, all BMES members learned how to conduct research through a group research project. The goal of this group research project was to use decellularized plant tissue in order to produce a scaffold that could be used to make bone tissue. BMES students went through brainstorming processes, learned how to contact professors, and learned lab techniques. Furthermore, all BMES students were also exposed to a variety of biomedical engineering topics through group presentations.

| Plant Decellularization<br>Project | Entire school year | All members |
|------------------------------------|--------------------|-------------|
| Instructional PowerPoints          | Entire school year | All members |

Students brainstorm and learn lab techniques during the plant decellularization project:





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Instructional Glyphosate Presentation:



## XI. INDUSTRY AND PROFESSIONAL DEVELOPMENT ACITIVITIES

In order to further our combined experience and knowledge in the biomedical engineering field, several members had volunteered in many locations this past year. In combination with the annual project and side activities, students were able to unite their BMES pursuits with career development and general understanding of related topics.

- Some have put in over 150 hours at the Sarasota Memorial Hospital, assisting nurses with daily activities and preparation of patients before seeing doctors. Others were involved with the Englewood Community Care Clinic and Englewood Community Hospital for around 80 hours, where they sorted patient files and medical charts (in addition to donating PPE). In accordance with the Pandemic and to reach out to the community, members volunteered at a COVID-19 vaccine drive at the Manasota Pediatrics for roughly 25 hours.
- Separately, certain students took a two-semester long Biotechnology Course to develop their understanding of biological and engineering applications of the medical sciences. The class concluded with a Certification process with an exam administered under University of Florida's high school program to be approved as a Lab Biotechnician Assistant.
- BMES club members created posters that explored various careers in biomedical engineering and presented them amongst one another. This poster creating and presenting fostered excitement for careers in biomedical engineering.







# XII.SOCIETAL IMPACT ACTIVITIES

Over the past year, the Pine View BMES club was able to engage with the community and make a proper societal impact through activities such as volunteering, training, donating, innovating, and serving in the biomedical and engineering environments around us.

Due to the aftermath of the pandemic, the blood supply of the local community rapidly dropped, and blood was desperately needed. In order to increase the number of blood donations, a website was created to be distributed out to Sarasota County high school seniors

in order to raise awareness for school blood drives and provide information. Various infographics were created for the website in order to communicate information. As a result of the website, the number of blood donations at Pine View School doubled. Schools provide one third of all blood donations. Thus, the success of this initiative held major impacts on the local community. You can find the website link here: https://tinyurl.com/pvbloodweb

| به ا                     | MPROVING DONOR<br>EXPERIENCE  |
|--------------------------|---|
| PRIOR TO THE<br>DONATION | <ol> <li>Download the SCBC Donor App to book appointments, get<br/>reminders, get results, and so much MORE!</li> <li>Get a good night's rest, eat a well-balanced meal, and<br/>drink plenty of water</li> <li>Avoid taking aspirin prior to the donation</li> </ol>               |
| AFTER THE<br>DONATION    | 1.Eat iron rich foods<br>2.Avoid heavy exercise<br>3.Keep bandage on for several hours  |
| OVERCOMING<br>FEAR       | <ol> <li>Consider bringing a friend for support</li> <li>Read or listen to music to distract yourself</li> <li>Be proud that you are facing your fear to save lives</li> <li>If you fear passing out, don't worry: staff will monitor<br/>condition after blood donation</li> </ol> |



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## XIII. NATIONAL BMES MEETING

Last year, a PVBMES member was successfully able to attend the 2021 BMES Annual meeting. Unfortunately, due to school COVID restrictions, only one student was able to attend the meeting, despite Orlando's proximity to Pine View School. At this meeting, Ray Min, the attending member, was able to interact with various BMES chapters and learn about them. This networking would prove to be crucial later in the school year in order to create inter-chapter connections and activities. The student also attended a question-and-answer session that was an incredibly valuable educational experience. Lastly, at the convention PVBMES was awarded the Outstanding High School Chapter Award. Following the convention, Ray Min had fun at Universal Studios with the tickets provided by the conference.

We are looking forward to the upcoming 2022 National BMES. Our goal for this conference is to present the research that we performed this year regarding our successful decellularization of plant tissue and its application to the growth of bone tissue. We compared several types of decellularized plant tissue and determined green lettuce and cucumber to be the most effective starting materials.

Pictures From Our Project:



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In addition to presenting our research at the National BMES conference, we also look forward to finding potential collaboration partners with whom we can host inter-chapter events. We will also connect with college BMES chapters to mentor our high school BMES chapter with their experiences. We would like to stay connected with industry professionals that we meet at the event as well, potentially contacting them in the future for further mentoring and guest speaker activities. We want to connect with diverse mentors who can offer us their personal outlooks on niches of the biomedical engineering field.

#### Pictures From the 2021 BMES Conference:





## XIV. FUTURE DIRECTION

This year, the club was able to achieve many of the goals set in previous years. The club more than doubled in size and there was the successful completion of a plant decellularization project. Furthermore, in order to assist our project, we were able to reach out with other BMES chapters, such as the BMES chapter of the Florida Gulf Coast University. Not only did we successfully complete our academic goals, but we were also able to complete social goals. We fundraised through a fun and interactive booth at the Pine View fair and held multiple events that enabled PVBMES members to interact with one another and bond over a passion for biomedical engineering.

Our long-term goal for the Pine View Biomedical Engineering Society is to expand to more club members, learn more about the industry, and teach others about the STEM-related knowledge we know. To do this, we aim to increase the number and quality of the initiatives we accomplish through the committees we divide ourselves into. Furthermore, though we were successful with plant decellularization, we hope to continue our current research project into the recellularization of the decellularized tissue.

There are a few future goals that the officers should accomplish in the following years. Officers should increase the number of activities, especially interchapter activities to recruit and maintain members. Additionally, officers should be sure to foster a welcoming environment for new members that could potentially be intimidated by the current research projects. Furthermore, there should still be the continues interaction with colleges and universities. These meetings are especially important for this high school BMES chapter because it gives students a look at potential options for their futures.

