Mental Wellbeing InSciEd Out: Health Partnerships with the Boys & Girls Clubs of Puerto Rico

Joanna Yang Yowler[1,2]*, Ana Mia Corujo Ramirez[3]*, Marcos I Roche-Miranda[4]*, Jennifer Alvarado[5], Yazayra Aponte Sauri[4], Ricardo A. Calderon Lopez[4], Amanda A. Heeren[3], Mary Helen Mays[6], Dena Mundy[7,8], Widalys Ortiz[9], Karen Weavers[3], Naima Yusuf[3], Karen G. Martinez Gonzalez[4], Maribel Campos Rivera[4], Chris Pierret[2,3]
*these authors contributed equally

(1) Mayo Clinic Jacksonville; (2) InSciEd Out; (3) Mayo Clinic Rochester; (4) University of Puerto Rico San Juan; (5) University of Minnesota Rochester; (6) The Hispanic Alliance for Clinical and Translational Research; (7) Rochester Public Schools; (8) Winona State University Rochester; (9) The Boys & Girls Clubs of Puerto Rico

Corresponding Author: Chris Pierret, 200 First Street SW, (a) Mayo Clinic Graduate School of Biomedical Sciences (b) Department of Biochemistry and Molecular Biology, Rochester, MN 55905, USA; 507.293.0814. Email: pierret.christopher@mayo.edu

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ABSTRACT

Background: Mental healthcare is a top clinical concern for modern Puerto Rico, especially given a dramatically changing economic landscape paired with recurrent natural disasters. Youth are particularly at-risk due to long-term impacts of toxic stress and ACEs upon health and development.

Objectives: Here we present a novel clinician-community-educator-scientist partnership to address Puerto Rican youth mental wellbeing and wellness. We deployed pilot health workshops within the Boys & Girls Clubs of Puerto Rico to build youth mental health conceptual understanding and competencies in stress recognition and management. The work in progress herein evaluates acceptability and feasibility of our curricular model.

Methods: Dialogue with community stakeholders guided curricular design of workshops for youth ages 6–13+. Prior to implementation, educators and volunteers attended a one-day training on educational strategies. Workshop success was evaluated using qualitative approaches (i.e. narrative feedback, educator and volunteer reflections, youth Talking Drawings) to assess youth engagement, youth conceptual health understanding, and educator/volunteer impressions of feasibility and impact.

Results: Initial findings indicate high acceptability and feasibility of our curricular model. Youth engagement and enthusiasm were noted in educator feedback and continue to be sustained post-workshop. Preliminary analysis shows accompanying increases in youth conceptual mental health, particularly for 6–12-year-olds in recognition of stress and healthy coping mechanisms. Reciprocal gains were observed for volunteers.

Conclusions: Activities have evolved into a formal partnership called *Semilla*, which features expanded analysis of mental wellbeing and wellness outcomes. Our collaborative model continues to engage Puerto Rican youth in the science of their wellbeing.

KEYWORDS: Community-Based Participatory Research, Community health partnerships, Mental Health, Curriculum, Children and Adolescents, Community health research, Health outcomes, Health promotion

INTRODUCTION

In Puerto Rico, mental health concerns have risen to the forefront of medicine over the past few decades. Taxation changes and dramatic economic shifts have destabilized financial and infrastructure control.[1] Recent natural disasters have exacerbated this collapse, adding to mental distress for island residents.[2–6] Such environmental challenges are sources of toxic stress, which result in high allostatic load. Resultant negative health outcomes include reductions in lifespan and quality of life, as well as increases in risk of chronic diseases and healthcare cost.[7–9]

Youth are particularly vulnerable to stress and trauma, which have known long-term impacts upon executive functions and behavioral coping.[10–14] Puerto Rico's increasingly severe recession and continued outmigration following natural disasters[15] have resulted in six in ten island children living in poverty.[16] Loss of youth educational services post-disasters has further disrupted social support systems key to social-emotional learning (SEL) and health.[17] As this cycle of adverse childhood experiences (ACEs) is now the norm for many Puerto Rican youth, mental wellbeing and wellness have become top public health areas of concern. Research on the long-term effects of ACEs show dose-responsive correlations with both general mental health indicators like high stress and emotional distress, as well as clinically specific outcomes like depression and post-traumatic stress disorder.[14] There is thus a need for innovative trauma-informed youth programming in Puerto Rico to mitigate the longitudinal effects of chronic toxic stress.

Here we present one such community partnership among the University of Puerto Rico School of Medicine (UPRSOM), Mayo Clinic Center for Clinical and Translational Science (CCaTS), Integrated Science Education Outreach (InSciEd Out), and the Boys & Girls Clubs of Puerto Rico (BGCPR). UPRSOM and CCaTS have a decades-long relationship rooted in medicine. InSciEd Out is a long-time collaborator with a strategic approach to community-engaged science and health through education. At partnership onset, UPRSOM had active

relationships with BGCPR, which provides after-school services to socioeconomically disadvantaged children.[18] As low socioeconomic status is a risk factor for ACEs and mental health problems,[9,19–21] the youth of BGCPR are an ideal audience for mental health promotion efforts.

This manuscript details lessons learned in developing our novel community-based participatory research (CBPR) model. The theoretical premise is InSciEd Out's Healthy Communities Hypothesis that youth engaged in the science of their own wellbeing will be empowered to make informed decisions about their health, driving positive behavioral changes in themselves and their communities that result in healthier lives. In our model, stepwise strengthening of relationships between education, science, medicine, and the community builds sustainable pathways for community action toward wellness. This follows InSciEd Out's working theory of health behavioral change, where the journey from awareness to wellbeing and wellness traverses many intermediate constructs like knowledge, beliefs, attitudes, skills, intentions, and behaviors (Appendix 1). Our framework draws from the Health Belief Model and the Integrated Behavioral Model.[22] The broader research strategy utilizes principles of trauma-informed curricula and the Eco-Bio-Developmental Model promoted in pediatric healthcare.[10,23,24] Our long-term goal is to build healthier Puerto Rican communities through empowering children as agents of change.

METHODS

The pilot described herein lays foundations for a long-term CBPR relationship with BGCPR youth and their communities. Initial efforts focused upon implementation and assessment of youth mental health workshops at partnering BGCPR sites. Conversations about mental wellbeing and wellness require rapport. As such, our pilot did not directly measure health impact. Instead, we explored key stakeholder impressions of program feasibility and acceptability with preliminary capture of student mental health understanding.

Community Dialogue: Cooperative teams from UPRSOM and CCaTS began evaluating community health needs across Puerto Rico in 2016. As teams regrouped after Hurricane Maria, mental health was unanimously identified as the biggest wellness need at all 13 BGCPR sites. Three potential pilot sites were identified, and cooperative teams visited each to dialogue with Club participants, leadership, and educators. The Las Margaritas Club (Santurce) and the Bayamón Club were selected for programming based on logistics, perceived need, and readiness for innovation.

Curriculum Adaptation: Pilot workshop curricula targeted conceptual health understanding for stress recognition and subsequent skill-building of healthy behavioral coping mechanisms. InSciEd Out's robust Mind & Body curriculum library already had units addressing these concepts in formal education. An InSciEd Out educator adapted lessons for use in BGCPR informal education spaces. Curricula were translated to Spanish by fluent collaborators, and materials were checked for concept consistency. Delivery was set for ages 6–8, 9–12, and 13+. Appendices 2–7 overview the curriculum at each club. One distinguishing feature of InSciEd Out curricula is use of the animal model zebrafish.[25,26] InSciEd Out's Healthy Communities Hypothesis uses zebrafish to build scientific understandings of health,[27] as they are a visual learning tool and a lower-risk proxy for conversations about wellbeing and wellness. Curriculum delivery ran January 14–18, 2019, for Las Margaritas and weekdays May 9–17, 2019, for Bayamón. Iterative revision was completed between runs from lessons learned.

Educator/Volunteer Workshop: Prior to program delivery, BGCPR educators reviewed the curriculum. UPRSOM and area graduate program volunteers participated in a one-day workshop co-hosted by BGCPR and

InSciEd Out. Training focused upon classroom strategies and zebrafish experimentation to build workshop competencies.

Youth Workshops: Delivery of the youth workshops included BGCPR educators as classroom leads, supported by volunteers and Mayo Clinic team members. Following BGCPR policy, youth participants voluntarily participated each day the program was offered. Activities reached an estimated 150 youth. A total of 48 volunteers engaged at Las Margaritas with a subsequent expert volunteer group (N=4) supporting Bayamón.

Evaluation: Because these workshops were pilots for longer-term partnership, evaluative questions focused on program acceptability and feasibility. Questions included: 1) Are the youth engaged in the included informal strategies?; 2) Is there measurable growth in conceptual health understanding of the participating youth?; and 3) What existing value and potential additional value do educator/volunteer participants see in the workshop? Interactions were deemed exempt by Mayo Clinic's IRB under Category 1 of 45 CFR § 46.104.

Youth Engagement: Engagement, a measure of program acceptability, was informally assessed through end-of-day meetings with BGCPR educators and relevant portions of educator reflections. Youth-driven workshop products were also documented.

Youth Conceptual Health Understanding: Youth participants were delivered Talking Drawing prompts pre-post workshop to assess growth in conceptual mental health understanding. Talking Drawings are a tool adapted by InSciEd Out[25] from prior models.[28,29] They consist of a written prompt with blank space for drawings and text. BGCPR educators read prompts aloud, and youth were given 5–10 minutes to respond individually.

Talking Drawing analysis first quantified student language by gathering written words and phrases, translating all text to English, and graphing results via a word cloud generator. Word clouds depict relative word abundance with increasing size of text corresponding to increasing word or phrase prevalence. Each Drawing was also evaluated for the presence of common emerging themes (drawings and text) informed by a concept bank of lesson keywords. Analysis involved a three-reviewer process to code youth responses.

Relevant portions of the educator reflections were also analyzed for perceived changes in youth mental health conceptual understanding.

Educator Reflections: BGCPR educators completed daily reflections about workshop experiences. Narrative comments were solicited for the following questions: 1) What went well today?; 2) What didn't go well?; 3) How could we make it better for next time?; and 4) What changed, challenged, or confirmed your thinking about students dealing with trauma today?.

Educator responses to the first two questions were qualitatively analyzed for emerging themes in program acceptability and feasibility. Two coders separately viewed the reflections and came up with initial coding structures. These coders then worked to create a consensus structure, which was used to separately re-code reflections. A last meeting reconciled any discrepancies and ordered emerging themes. Where appropriate, responses in Spanish have been translated to English by native Spanish speakers for publication.

Volunteer Reflections: Las Margaritas workshop volunteers set goals for their CBPR experience during the volunteer workshop. At the end of their interactions with club youth, volunteers completed reflections concerning goal-meeting, positive take-aways, and recommended changes. This captured another dimension of program acceptability and feasibility.

Volunteer reflections were analyzed using the methodology above for educator reflections by two independent coders. Any Spanish responses were translated prior to coding.

RESULTS & LESSONS LEARNED

Youth Engagement: BGCPR educators and volunteers noted that youth, particularly the 9–12-year-olds, were engaged with the mental health workshops. Activities resulted in the creation of a Science Club at Las Margaritas, where participants (largely from the 9–12-year-old cohort) continue zebrafish husbandry and research. This demonstrates a sustained increase in scientific interest, indicating high acceptability of our curricular model. Science Club youth have eagerly shared their partnership experiences and ongoing research at various public venues (Figure 1).

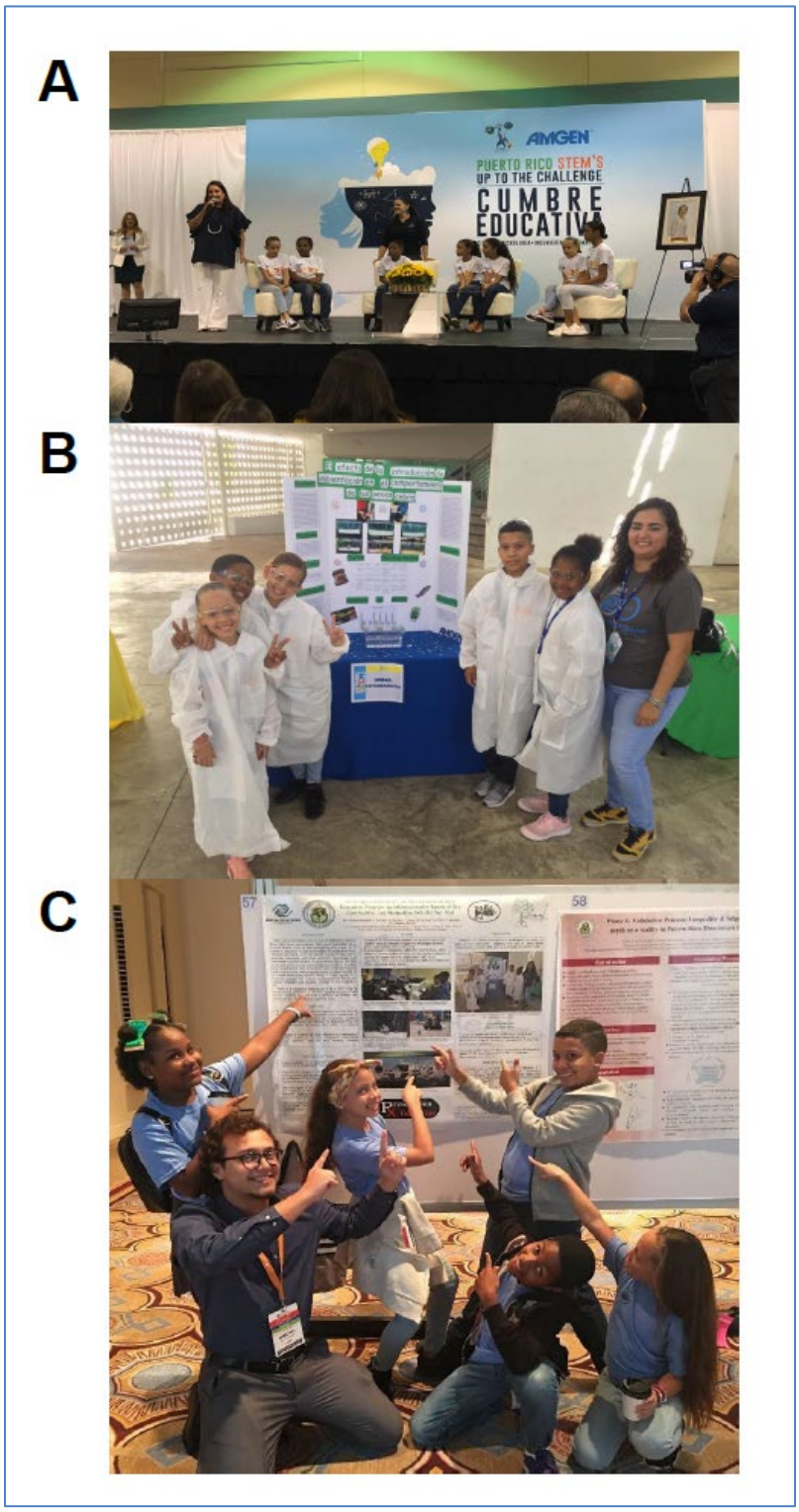

Figure 1. Continued Interactions at the Las Margaritas Club.
Las Margaritas Science Club achievements show sustained student engagement post-workshop. Science Club students presented at: 1a. AMGEN's Puerto Rico STEM's Up to the Challenge Educational Summit; 1b.

AMGEN's BGCPR Science Fair 2019 (alongside educator Widalys Ortiz); and 1c. 2019 Puerto Rico Clinical Research Summit (alongside volunteer Marcos Roche Miranda).

Lessons Learned: Club usage evaluation shows that 6–8-year-olds come to play and 13+-year-olds come for homework help. 9–12-year-olds more commonly utilize the Club for extracurricular programming, so this age range will be our CBPR focus moving forward.

Youth Conceptual Health Understanding: Logistical barriers precluded complete collection of Talking Drawings at Las Margaritas, so results are only presented for students with paired pre-post responses at Bayamón. High student flux resulted in a limited subset of available drawings for analysis. Student language quantification via word clouds showed an increase in conceptual health understanding across all age bands (Figure 2). Responses for 6–12-year-olds revealed that students better recognized stress and healthy coping mechanisms post-workshops. In the 13+ age group, a wider range of terminology regarding food and mental health appeared in the post-Drawings.

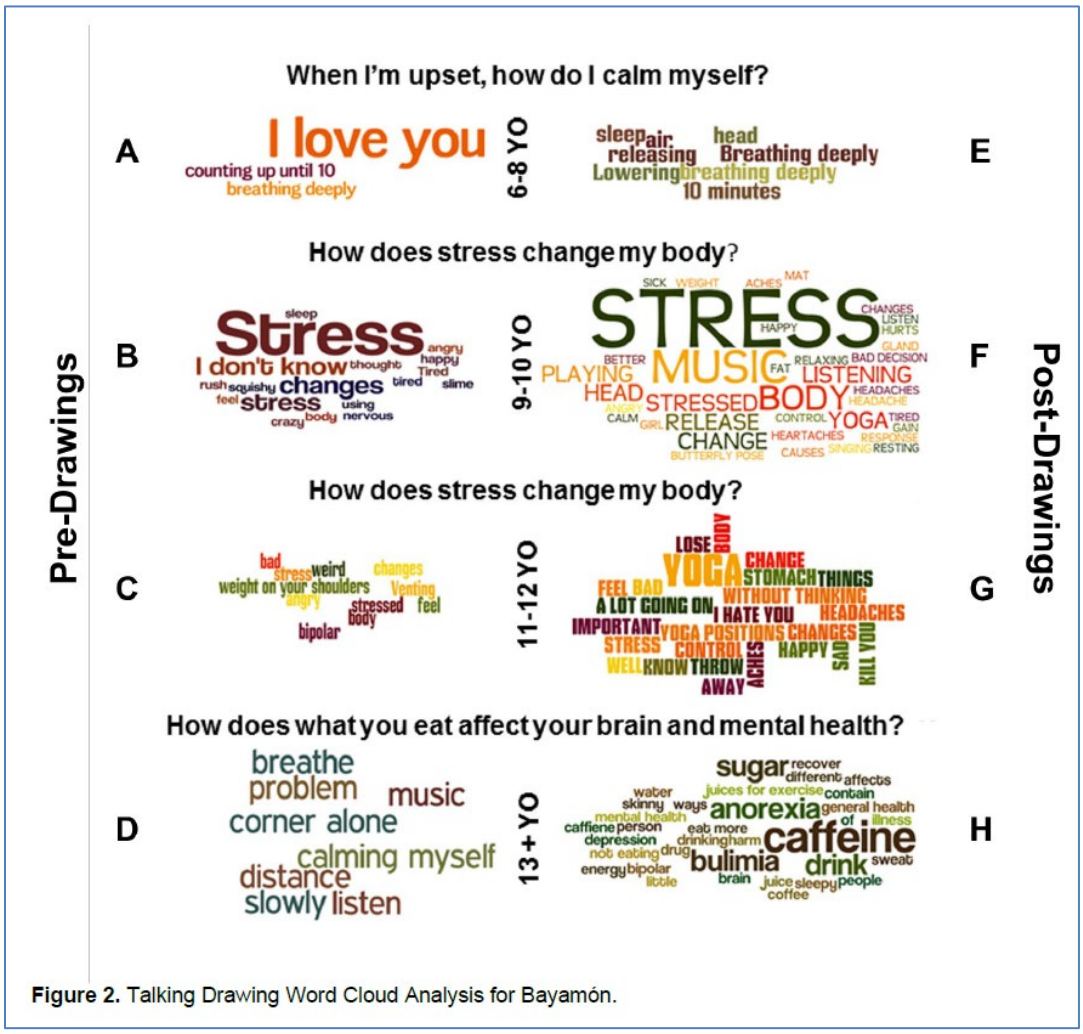

Figure 2. Talking Drawing Word Cloud Analysis for Bayamón.

Figure 2. Talking Drawing Word Cloud Analysis for Bayamón.
Pre- (A–D) and post- (E–H) Talking Drawings reveal marked changes in student language use related to coping strategies for stress and anxiety. Responses have been translated to English for ease of review, so secondary removal of articles and prompt words has not been completed based on our traditional methodology.

Emerging theme analysis showed similarly positive shifts in health understanding for all cohorts. In the 6–8-year-old group, the 5 learners with pre-post Talking Drawings mostly concentrated on emotions in the pre- (N=3) but named explicit strategies in the post- (N=4). Combined analysis of the 9–10-year-old and 11–12-year-old cohorts (N=12) showed simplistic/off-topic responses in the pre- (an indicator of low baseline understanding) that turned to strategies and/or tools for alleviating stress in the post- (N=8). Neither learner

(N=2) answered the question as written in the 13+ pre-Drawing, but both students named explicit ways in which diet affects the brain and mental health in the post-Drawing.

Educators reported perceived growth in student mental health knowledge post-programming through their reflections at both sites (full analysis below, Tables 1 and 2). More anecdotal evidence was cited at Bayamón (N=6) than at Las Margaritas (N=2) with the majority of mentions in the 9–12-year-old space (N=5). Additionally, educators report that coping strategies taught within our workshops continue to be utilized by their youth to this day.

Lessons Learned: We observed low adherence to Talking Drawing administration exacerbated by high student flux. An external advisory committee has been formed to ensure study metrics continue to be selected cooperatively and that all stakeholders understand the importance of data.

Educator Reflections: Tables 1 (Las Margaritas) and 2 (Bayamón) describe categorized themes for teachers' responses to 'What went well?' and 'What didn't go well?'. Comments were distributed across three main categories: curriculum, participants, and volunteers. See Appendix 8 for more details.

Program acceptability was high, as participants' enthusiasm was the most common positive theme, followed by curricular teaching strategies. While the program was deemed feasible, common critiques focused upon optimizing logistical concerns in curricular content modification, followed by better time management and changes in classroom size. Promoting enthusiasm for older students, specialized training for staff, and adapting lessons to community health priorities were relevant programmatic areas for improvement. Positive comments toward the project's curriculum were similar at both sites. In all ages except in the 13+ group, Bayamón teachers noted more classroom management issues than Las Margaritas teachers. This was partly due to disruptions at Bayamón, where ongoing activities conflicted with workshop timing.

Lessons Learned: Unique logistical barriers exist at different BGCPR sites. More explicit planning questions have been included as part of Club onboarding.

Volunteer Reflections: Volunteer responses to goal setting are reported in the top of Table 3. These goals are split between those for personal growth versus public benefit. See Appendix 9 for more details. All volunteers (N=21) reported meeting at least some of their goals in their exit reflections. The only goals explicitly not met were in research experience. This occurred for three volunteers who were scheduled to complete student observations but instead served as classroom leaders due to large student numbers.

The most reported positive take-away from CBPR participation (bottom of Table 3) was in life skills and/or learning. Positive memories, perspective growth or changes in motivation, and increased citizenship or social consciousness were also reported. Volunteer-recommended programmatic changes were logistical, lesson-specific, and organizational (in decreasing order of prevalence). Some examples included: shortening lessons while extending curricular timeframe, decreasing class size, providing increased classroom support via more volunteers, utilizing different activities/strategies, collecting/sharing feedback on program efforts/effects, and providing formal volunteerism documentation.

Lessons Learned: Pilot workshops forged novel, authentic exposure and connections between volunteers and their communities. Volunteerism has been restructured into an annual fellowship to curate a formal pool of near-peer mentors for long-term program continuity.

DISCUSSION

The pilot presented herein sought to hone a novel CBPR framework for mental wellbeing in a Puerto Rican youth population. Initial mental health workshops showed high program acceptability and feasibility with

preliminary gains in youth's mental health understanding and practice of stress and stress coping. While partnerships for community action are not new, our clinician-community-educator-scientist model is an innovative approach to public health previously untested in BGCPR settings.

Challenges & Limitations: Perhaps the most marked challenge we faced in establishing our CBPR model is the ever-changing environment of BGCPR. Club leadership mentioned flux in passing, but all partners were surprised by how variable student attendance was and the impact this had upon evaluations. BGCPR youth often do not attend Club every day due to conflicting activities, familial responsibilities, and intrafamilial violence. Ongoing school closures also result in decreased Club attendance due to transportation issues, which was a factor at Bayamón. This greatly limited our preliminary evaluation of youth conceptual health understanding, as high flux impacted both amount of workshop curriculum received and presence of pre-post matched evaluation. An additional limitation to our work is its necessary focus upon rapport building that precluded further assessments of mental wellbeing and wellness. This particular limitation was by design, however, and is addressed below in our Future Directions.

Lessons Learned & Broader Applications: The challenges above are not unique to our partnership or to BGCPR, so lessons learned can be broadened as advice to others partnering in similar community spaces.

First, it is imperative to consider expectations alignment when introducing new community programming. No amount of meetings could have prepared us for the Club environment, but spending more time in the space to observe youth and their use of the Club might have allowed us to narrow our focus to the 9–12-year-olds sooner. This specification of target audience addresses some of the high-flux issues that plague community centers and devotes resources where they are likely to have most impact.

Second, emphasizing the research in CBPR is essential for community partnerships. Not all partners are well versed with evaluation, so the merits of evidence-based programming are not self-evident. Gathering community data requires rapport, and dialogue with community leaders opens doors for robust data collection. This ensures that all stakeholders feel invested in the evaluation process.

Third, what works for one community may not work for another. Broad strokes may be transferable, but even multiple sites within an organization have their own culture and unique needs. Building protected time for programming adaptation fosters better relationships and more equitable partnerships.

Finally, reciprocal gains in CBPR should never be discounted, as all partners benefit from interactions with their communities. Soliciting feedback from every stakeholder collects multi-perspective insights. Long-term investment into all arms of a community partnership strengthens collaboration, paving new avenues for impact.

Sustainability and Future Directions: Our continued efforts post-pilot have evolved into a partnership called *Semilla*, funded in part by a NIH Science Education Partnership Award (GM137368). *Semilla* features an expanded curricular scope with resilience training (i.e. *Semilla* Mindfulness) and heightened clinician roles through embedded clinical resources (i.e. pediatric residency). This includes assessment of ACEs; mental wellbeing outcomes like mindfulness (Child and Adolescent Mindfulness Measure), mood (Face Mood Questionnaire), and personal perception of happiness (Perceived Stress Scale for Children); and wellness outcomes in depression (Center for Epidemiologic Studies Depression Scale) and anxiety (Screen for Child Anxiety Related Emotional Disorders). Talking Drawings continue to capture conceptual health understanding and are additionally being analyzed by child psychiatrists for signs of psychological distress. Participants are now actively recruited into *Semilla* activities to combat attrition with a more manageable ~12 students per run.

While our program remains fully voluntary, recruitment emphasizes consistent attendance across eight weeks of *Semilla-SEL* curriculum. Two newly appointed CBPR evaluators ensure completeness of data collection.

Results from our initial pilot were shared in strategic meetings with BGCPR leadership and at each site through community forums. Stakeholder meetings and parent nights have also been created for youth to disseminate effects into their broader communities. Common program components presented include Mindfulness, breathing exercises, the science of stress, and zebrafish model work.

Implications: Innovative programs to address youth mental wellbeing and wellness are more important than ever given the ongoing COVID-19 pandemic and its contribution to toxic stress loads.[30,31] Puerto Rico continues to struggle with long-term infrastructure damage from natural disasters, adding to ACEs during its longstanding economic recession. *Semilla*'s melding of education, medicine, and science presents a true CBPR model that harnesses partner strengths to build competencies for transformative community change. Our approach shifts the traditional healthcare model toward a 'life course science' approach, moving from 'what is wrong with you?' to 'what happened to you?' in the development of a comprehensive care plan.[24] Such a framework has the potential to be utilized in diverse populations given appropriate community dialogue and modifications for cultural relevance. Together, we seek a reality where children are agents of change for their own health, as well as for their families and the world at large.

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	Concept	6–8 N	6–8 Example Quote	9–12 N	9–12 Example Quote	13+ N	13+ Example Quote
What went well?							
Curriculum	Lab Experience	2	“The student[s] really liked the experiment”	2	“The laboratory was the best thing for the kids”	0	Not mentioned
Curriculum	Teaching Strategy	2	“All activities [were] very fine”	2	“Kahoot was the best part of the class”	2	“Build a Brain- Construction Time [activity] [went well]”; “Team Presentation [activity] [went well]”
Curriculum	Coping Strategy	1	“The students used the calming strateg[ies] [at] more time[s] [of] the day”	2	“Zumba exercise, all students participated very excited”	0	Not mentioned
Participants	Enthusiasm	3	“The students were very enthusiastic about the experimental area of this lesson”	4	“The kids were very happy to see the fishes”	0	Not mentioned
Participants	Skill Retention	2	“The students express[ed] knowledge of emotion control and relaxation [...]”	0	Not mentioned	0	Not mentioned
Participants	Student Amount	0	Not mentioned	1	“We received less student[s]; it was [easier to] manage”	0	Not mentioned
Volunteer	Engagement	1	“The connection between the volunteers and the children [was] excellent”	1	“The volunteers were more engage[d] and active”	1	“The connection of the participants with the volunteers in the teamwork [went well]”
What didn’t go well?							
Curriculum	Content	2	“The stress video should be simpler for the level”	4	“Some questions were not correctly formulated”	3	“Some words and concepts were very high for the level of knowledge of the students”
Curriculum	Time Management	1	“Read Inside Out Book [activity was too] long”	3	“The Lab activity was hard to comply [with]. Needs more preparation time”	1	“This lesson requires more time”; “The part of the laboratory had to be done the next day.”
Curriculum	Organization	0	Not mentioned	2	“[Need] a formal training that include[s] discussion of the materials with each activity”	0	Not mentioned
Participants	Student Amount	1	“Too [many] kids at the same time”	1	“The number of participants [was] too big to manage the class.”	3	“The students could not do the lesson because they had school tasks”
Participants	Student Focus	0	Not mentioned	2	“Too many interruptions […] The press and other visitors were around. The kids got distracted”	2	“The first drawing could not be made due to lack of interest of the participants”
Volunteer	Engagement	1	“I need more intervention [from] the volunteers”	2	“The volunteers need to be more engaged or more active”	0	Not mentioned
Volunteer	Communication	0	Not mentioned	1	“Improve the communication lines between scientific partners and educational leaders”	0	Not mentioned

Table 1. Las Margaritas Teacher Reflections. Emerging themes are reported by concept with example teacher quotes and prevalence.

	Concept	6–8 N	6–8 Example Quote	9–12 N	9–12 Example Quote	13+ N	13+ Example Quote
What went well?							
Curriculum	Lab Experience	5	“The students liked being exposed to the fish […]”	9	“[…] the children were excited […] to know what would happen when they used the microscope”	4	“Students were happy to see the fishes and do the observations”
Curriculum	Teaching Strategy	5	“They really liked the pictures of puppies and happy faces”	6	“The children really enjoyed the snowball activity”	6	“The introductory game went well. We completed the session's objectives”
Curriculum	Coping Strategy	0	Not mentioned	5	“Children participated in the mindfulness session and felt calm after the breathing exercises”	0	Not mentioned
Participants	Enthusiasm	7	“They were very excited”	9	“The students were excited to learn”	7	“Students were attentive [and] motivated”
Participants	Skill Retention	1	“The kids were very receptive in the class and I feel they learnt. They answered anything we asked and they recalled the information”	5	“Students have a better grasp of anatomical structures related to stress. […] Students explained that when they're exposed to stress, cortisol levels are high”	0	Not mentioned
Participants	Student Amount	0	Not mentioned	1	“We had great attendance”	1	“We achieved an appropriate group size”
Volunteer	Engagement	0	Not mentioned	0	Not mentioned	0	Not mentioned
What didn’t go well?							
Curriculum	Content	6	“They didn't understand the topic or the parts of the brain”	4	“During the last period, the students didn't understand what they were doing and showed resistance”	7	“We need more visual examples (images) for the food session”
Curriculum	Time Management	2	“We ran out of time”	2	“There were many Club activities that conflicted with the project's schedule”	3	“We ran out of time”
Curriculum	Organization	0	Not mentioned	2	“They showed resistance to start the activities, so we had to modify the activity to start with the relaxation exercises because the group was too energetic”	3	“We need more teacher preparation time. Divide the topics because we all talked”
Participants	Student Amount	2	“Very low student number”	10	“The children were very unsettled during the whole session”	1	“Very low student number”
Participants	Student Focus	4	“Students were very hyper, not taking instructions”	10	“Too many students had to leave the session before completion and that distracted the other participants”	1	“Group control was hard sometimes”
Volunteer	Engagement	0	Not mentioned	0	Not mentioned	0	Not mentioned
Volunteer	Communication	0	Not mentioned	0	Not mentioned	0	Not mentioned

Table 2. Bayamón Teacher Reflections. Emerging themes are reported by concept with example teacher quotes and prevalence.

Concept		N	Example Quotes
Goals			
Personal Growth	Learning / Educational	15	“[…] I would love to learn as much as I could from the children and this experience”
	Research Experience	8	“I would like to gain more hands-on research experience with this opportunity”
	Skills / Competencies	5	“I also hope to gain new skills and strengthen the ones I have gained through different experiences”
	Enjoyment / Fun	3	“I hope to see students enjoy and learn […] See[ing] people have fun while they learn always brings me joy”
Public Benefit	Impact / Help Kids	11	“Hopefully make a difference or impact in some good way at least one child during the experience”
	Program / Participant Interaction	8	“To provide a helping hand in the project” (program) “[…] to connect with the kids […]” (participant)
	Community Engagement / Aid	5	“I hope [to] provide a useful service to the community” “I want to feel like I’m making a difference for my people”
	Help Society (At Large)	4	“[…] to do a part on this research that would help many children not only in Puerto Rico, but around the world”
Positive Take-Aways			
Life Skills / Learning		17	“[…] experience what is teamwork and leadership […] learn different techniques [sic] to know how [sic] manage stress”
Memories / Joy		9	“I take from this project a great memory, and the joy to continue contributing with projects/works like this one”
Motivation / Perspective Growth		9	“I take with me the fact that this gave me perspective of our children’s life [sic] and their motivations”
Citizenship / Social Consciousness		6	“I will try to impact more young lives and to be a role model for them”

Table 3. Volunteer Reflections from Las Margaritas. Emerging themes are reported by concept with example volunteer quotes and prevalence.

APPENDICES

- **Appendix 1.** Change-opolis: InSciEd Out's Working Theory of Health Behavioral Change
- **Appendix 2.** A Healthy Brain: Las Margaritas 6–8 Module at a Glance
- **Appendix 3.** Stress Impacts Mental and Physical Health: Las Margaritas 9–12 Module at a Glance
- **Appendix 4.** Food, The Brain, and Mental Health: Las Margaritas 13+ Module at a Glance
- **Appendix 5.** A Healthy Brain: Bayamón 6–8 Module at a Glance
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- **Appendix 8.** Notes on Emerging Themes and Qualitative Coding for the Educator Reflections
- **Appendix 9.** Notes on Emerging Themes and Qualitative Coding for the Volunteer Reflections

All appendices are presented in English for journal readability. Specific curricular changes made in the transition from Las Margaritas (Appendices 2–4) to Bayamón (Appendices 5–7) included: (1) split of the 9–12 group to 9–10 and 11–12 cohorts based on developmental needs; (2) workshop extension to 7 days to allow for richer interactions with students; (3) increased number of breaks and activities with body movement as outlets for student energy; and (4) an additional focus on nutrition as the onset of how to meet total wellbeing goals.

Appendix 1. Change-opolis: InSciEd Out's Working Theory of Health Behavioral Change

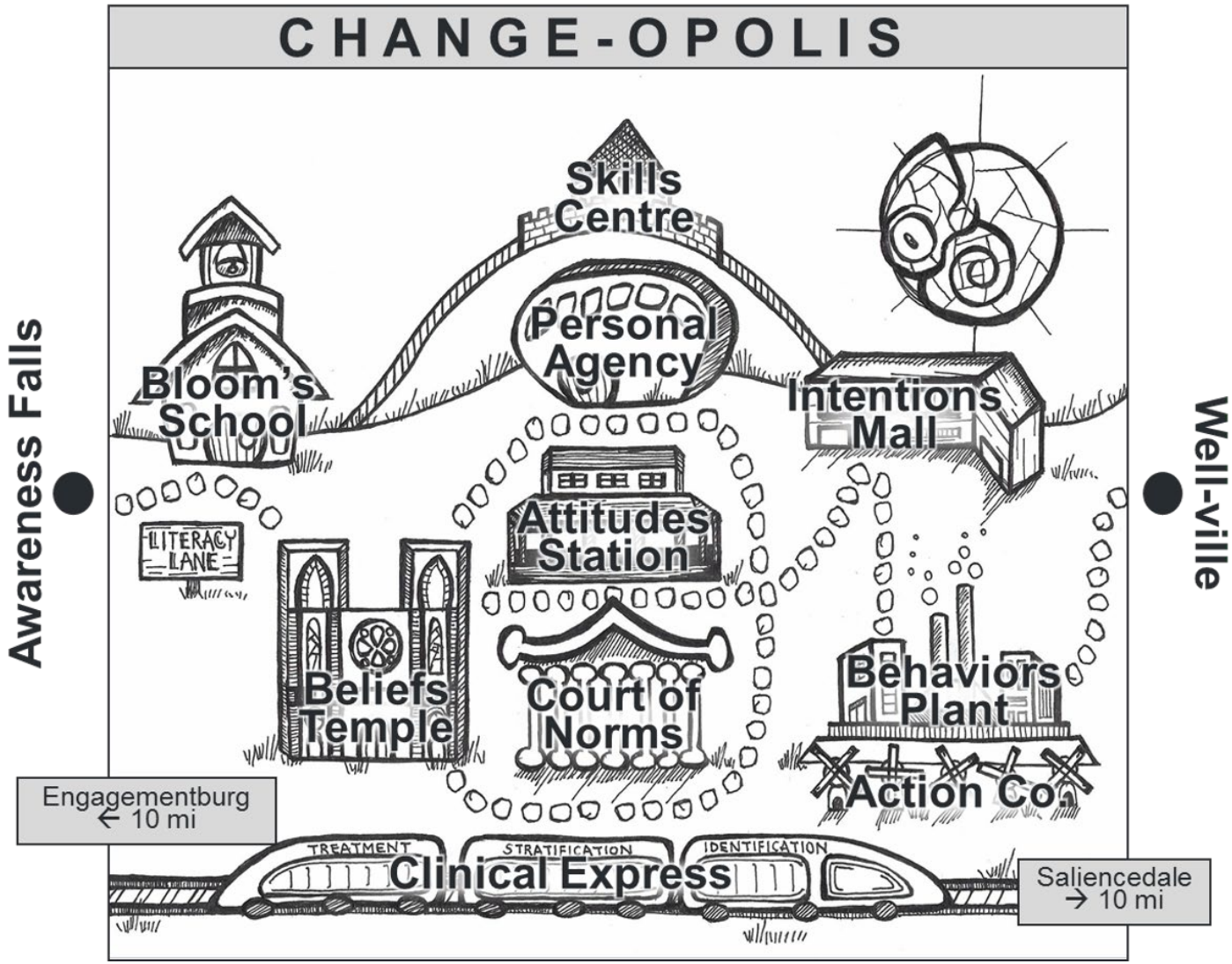

Figure Legend: Change-opolis depicts InSciEd Out's working theory of health behavioral change that draws from existing models of individual health behavior (i.e. Integrated Behavioral Model; Health Belief Model). Journeying from awareness (Awareness Falls) to wellness (Well-ville)

traverses many intermediate constructs. The first stop is Bloom's School, where knowledge acquisition builds perceived health susceptibility, severity, benefits, and barriers as cues for action. These perceptions and cues lead to Beliefs Temple, which holds behavioral, normative, and control/efficacy beliefs. From here, the path diverges toward Personal Agency (i.e. self-efficacy), Attitudes Stations (i.e. experiential and instrumental attitudes), and the Court of Norms (i.e. perceived norms). All roads converge upon Intentions Mall, where behavioral intentions as formed, as the final stop before Behaviors Plant, where actual behaviors emerge because of actions (Action Co.). In this model, clinical aid moves Change-opolis inhabitants from engagement (Engagementburg) to salience (Saliencedale) through identification, stratification, and treatment of health complications (Clinical Express). Individual journeys through Change-opolis vary based on differential life experiences. Mapping the journey is key to *Semilla*'s work in reaching beyond simple awareness to consciously build and evaluate sustainable community competencies approaching wellness.

Appendix 2. A Healthy Brain: Las Margaritas 6–8 Module at a Glance

Minute	Monday **Our brain controls our emotions**	Tuesday **Our emotional response affects our brain chemistry**	Wednesday **We control how we react to our emotions**	Thursday **Knowing how to control our emotions is part of having a healthy brain**	Friday **Review all**
0–15	Talking Drawing Pre: "When I'm upset, how do I calm myself?"	Review concepts & vocabulary (use KWL)	Review concepts & vocabulary (use KWL)	Review concepts & vocabulary (use KWL)	Review concepts & vocabulary (use KWL)
15–30	KWL about brain and emotions (K–W)	Glitter Bottle: What happens inside our brain when we are upset?	Role play reactions to events using pictures	Review calming strategies used	Small Groups: Review experiment from yesterday
30–45	Read *Inside Out* Book	Discussion and List: What can we do when we are upset?	Calming Strategies: I am Calm, Energy Hands, Deep Breathing	Calming Strategy: Yoga	Small Groups: Create poster
45–60	Discuss *Inside Out* and how our brain controls our emotions (add to KWL)	Calming Strategies: Deep Breathing, Butterfly Breathing	Small Groups: Create a question to explore about zebrafish and emotions	Small Groups: Review question, how the experiment will be set up, and data collected	Small Groups: Practice presenting
60–75	Emotional Relay: Build a face to match the emotion	Discussion, Observation, and Inferences: Do zebrafish show emotions?	Small Groups: Plan how to test questions, list the materials needed	Small Groups: Run experiment and collect data	Calming Activity: Student choice
75–90	Observe adult zebrafish using the five senses	Observe where and how the zebrafish are swimming in the tank	Small Groups: What data will you collect and how?	Small Groups: Discuss data	Small Group: Share poster with another small group
90–105	Record/draw what you observe	Discuss and make inferences based on observation	Calming Strategy: Tense & Release, Butterfly Breathing, I am Calm	Students journal about data	Whole group shares AHA's
105–120	Review and student journaling/drawing (add to KWL)	Review KWL and student science journal	Review KWL and student science journal	Review KWL	Talking Drawing Post: "When I'm upset, how do I calm myself?"

Appendix 3. Stress Impacts Mental and Physical Health: Las Margaritas 9–12 Module at a Glance

Minute	Monday **Stress impacts mental and physical health**	Tuesday **Stress affects everyone differently**	Wednesday **Common stressors and their health impacts**	Thursday **Negative ways to deal with stress**	Friday **Positive ways to deal with stress and concept review**
0–15	Talking Drawing Pre: "How does stress change my body?"	Review concepts and vocabulary	Review concepts and vocabulary	Review concepts and vocabulary; make a list of stressors	Review concepts and vocabulary; positive coping strategies
15–30	Your Body Under Stress: Drawing	Stressed / Not Stressed Self-Evaluation	Graffiti Walk: Types of Stress	Build and Test a Bridge Activity: Negative coping	Brainstorm and Graffiti Walk
30–45	Discuss stress	Cortisol Cup Activity	Graffiti Walk: Types of Stress	Discussion and bridge repairs	Guided Experiment: Set-up and observation for typical movement
45–60	Discuss stress	Zebrafish & I Wonder Activity	Kahoot: Review of learned concepts	Discussion	Guided Experiment: Data collection and analysis
60–75	Science of Stress Activity	Guided Experiment: Set-up for tail flipping	Guided Experiment: Set-up for heart rate	Guided Experiment: Set-up for heart rate under stress	Guided Experiment: Movement under stress
75–90	Science of Stress Activity	Guided Experiment: Observation and tail flip data collection	Guided Experiment: Observation and heart rate data collection	Guided Experiment: Observation and data collection for heart rate under stress	Data collection and reflection
90–105	Meet the Zebrafish: Observation	Data collection and reflection	Data collection and reflection	Data collection	Yoga or Zumba
105–120	Why Zebrafish? and Review	Review	Discussion and review	Discussion and review	Talking Drawing Post: "How does stress change my body?"

Appendix 4. Food, The Brain, and Mental Health: Las Margaritas 13+ Module at a Glance

Minute	Monday **Introduction to brain**	Tuesday **Brain and Food Connection**	Wednesday **Mental Health/Mental Illness**	Thursday* **Connecting Food, Brain, & Mental Health**	Friday* **Connecting Food, Brain, & Mental Health**
0–15	Talking Drawing Pre: "How does the food we eat impact our mental health?"	Review concepts and vocabulary; Journal: What did you eat yesterday?	Review concepts and vocabulary; Journal: What did you eat yesterday?	Review concepts and vocabulary; Journal: What did you eat today?	Review concepts and vocabulary; Journal: What did you eat today?
15–30	Build a Brain: Planning	TedEd Video and Discussion: How food affects your brain	What is Mental Health?	Zebrafish Movement Experiment: Set-up	Zebrafish Sleep Behaviors Experiment: Video review
30–45	Build a Brain: Construction	Teams: Work time	Types of Mental Illness: Presentation preparation	Discussion: How is the food we eat connected to our brain and our mental health?	Zebrafish Sleep Behaviors Experiment: Data collection
45–60	Build a Brain: Labeling and clean-up	Teams: Presentation and review of "what is the ideal diet for your brain?"	Types of Mental Illness: Presentations		Zebrafish Sleep Behaviors Experiment: Data analysis
60–75	Journal: What did you eat today?	Observation: Day 2 zebrafish	Zebrafish Caffeine Experiment: Set-up	Zebrafish Movement Experiment: Data collection	Zebrafish Sleep Behaviors Experiment: Data discussion
75–90	Discussion: Why zebrafish?	Discussion: Zebrafish and labelling	Zebrafish Caffeine Experiment: Heart rate observation and data collection	Zebrafish Movement Experiment: Data analysis	Zebrafish Sleep Behaviors Experiment: Data share-out
90–105	Observation: Day 1 zebrafish	Observation & Data Collection: D2 heart rate	Zebrafish Caffeine Experiment: Data analysis	Zebrafish Sleep Behaviors Experiment: Set-up	Module wrap-up
105–120	Discussion: Zebrafish and labelling	Discussion and reflection	Discussion and reflection	Discussion and reflection	Talking Drawing Post: "How does the food we eat impact our mental health?"

*Lessons not delivered

Appendix 5. A Healthy Brain: Bayamón 6–8 Module at a Glance

	Emotions & Feelings	**Calming Strategies**	**Zebrafish**
Thursday, Day 1	● Know Your Emotions Video ● Coloring Activity	Pre- Talking Drawing	Adult Zebrafish Observations - Draw what you see
Friday, Day 2	● Build an Emotion Game	● Butterfly Breathing ● I am Calm ● Quick Tense & Release	Adult Zebrafish Observations - Similarities between humans and fish
Monday, Day 3	● Amygdala in a Bottle	● Belly Breathing ● Energy Hands ● Yoga	Adult Zebrafish Observations (Day 1) - Add a Glofish to a WT tank - Hypothesize, observe, record
Tuesday, Day 4	● Emotion Roleplay with Pictures	● Hand Tracing ● Bring it Down ● Mountain Stretches	Adult Zebrafish Observations (Day 2) - Add a Glofish to a WT tank - Hypothesize, observe, record
Wednesday, Day 5	● The Way I Feel	● Triangle Breathing ● External Gazing ● Forward Stretch ● Back and Side Stretch	Adult Zebrafish Observations (Day 1) - Add another Glofish of the same color - Hypothesize, observe, record
Thursday, Day 6	● The Brain Says Game	● Review	Adult Zebrafish Observations (Day 2) - Add another Glofish of the same color - Hypothesize, observe, record
Friday, Day 7	● Those Shoes Story	Post- Talking Drawing	Share findings with others
Additional Spanish Resources	● Me Siento Hoy (Today I Feel) Song ● Diego Luna: Emociones (Emotions) Video	● Yoga: Cuenta de las Mariposas (Butterfly Breathing) ● Elmo & Lola - Respira Cuenta 5 (Breathing Video)	

(Each block represents 30 minutes of time.)

Appendix 6. Stress Impacts Mental and Physical Health: Bayamón 9–10/11–12 Module at a Glance

	Stress	**Coping Strategies**	**Zebrafish**
Thursday, Day 1	● What is Stress?	Pre- Talking Drawing	Embryo Observations Day 0 - Draw what you see - Label
Friday, Day 2	● Stress Response System	● Butterfly Breathing ● Bring it Down ● Progressive Muscle Relaxation	Embryo Observations Day 1 - Draw what you see - Label - Measure yolk size - Hypothesis
Monday, Day 3	● Common Stressors ● Cortisol Cup Activity	● Belly Breathing ● Body Scan ● Yoga	Embryo Observations Day 4 - Draw what you see - Label - Measure yolk size
Tuesday, Day 4	● Types of Stress	● Hand Tracing ● Mindfulness ● Relaxing Stretches	Embryo Observations Day 5 - Record movement (video) - Collect and record data
Wednesday, Day 5	● Kahoot Review Game	● Snowball Review Strategies	Embryo Observations Day 6 - Record movement (video) - Stress with flashlight - Record movement (video)
Thursday, Day 6	● Sorting Coping Strategies	● Coping Strategy Origami	Analyze video recordings
Friday, Day 7	● Preparing to Share	Post- Talking Drawing	Share findings with others

(Each block represents 30 minutes of time.)

Appendix 7. Food, The Brain, and Mental Health: Bayamón 13+ Module at a Glance

	Food (make, snack, learn)	**Brain & Mental Health**	**Zebrafish**
Thursday, Day 1	Pre- Talking Drawing	● Build a Brain	Embryo Observations Day 0 - Draw what you see - Label
Friday, Day 2	● Healthy Eating	● Mental Health, Myths, and Stigma	Embryo Observations Day 1 - Draw what you see - Label - Measure yolk size - Count tail flips - Hypothesis
Monday, Day 3	● Fat & Protein	● Depression	Embryo Observations Day 4 - Draw what you see - Label - Measure yolk size - Count heart rate, if possible
Tuesday, Day 4	● Sugar	● Anxiety	Embryo Observations Day 5 - Movement: Acute sugar - Record movement (video)
Wednesday, Day 5	● Caffeine	● Eating Disorders	Embryo Observations Day 6 - Movement: Acute caffeine - Record movement (video)
Thursday, Day 6	● Fluids	● PTSD	Analyze video recordings
Friday, Day 7	Post- Talking Drawing	● Preparing to Share	Share findings with others

(Each block represents 30 minutes of time.)

Appendix 8. Notes on Emerging Themes and Qualitative Coding for the Educator Reflections

In the “What went well?” section, lab experience referred to lessons incorporating zebrafish. The coping/teaching strategy categories alluded, respectively, to practical techniques to manage stress (i.e. yoga) and conceptual lessons about wellbeing (i.e. stress pathway activity). Comments under participant enthusiasm underlined students’ positive reactions to lesson activities, while the skill retention category noted instances where students recalled material or applied techniques learned. For the “What didn’t go well?” section, curriculum concerns revolved around the lessons themselves (content), the available time for preparation or execution (time management), and the general workshop structure (organization). Responses concerning interruptions or disinterest were categorized under student focus, and the volunteer communication category captured inefficiencies in dialogue between teachers and volunteers. The student amount and volunteer engagement categories appeared in both sections with the former referring to classroom size and the latter showcasing connections between volunteers and BGCPR students.

Appendix 9. Notes on Emerging Themes and Qualitative Coding for the Volunteer Reflections

Personal goals centered heavily on learning something new through volunteering, although gaining research experience, building skills and/or competencies, and having enjoyment and/or fun were also mentioned. Public benefit goals focused upon impacting and/or helping kids and interacting with the program and/or its participants. Other concepts expressed included wanting to engage and/or aid the community and to help society at large.