Fall 2020 End of Semester Memo

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1) Introduction

The main objective of the AguaClara (AC) Conference Subteam was to set up the first annual AC Conference, as well as provide a basis for future AC Conference Subteams to plan future AC Conferences. The AC Conference is a gathering of students and professionals alike who are drawn together by the mission to provide safe water on tap. It involves presentations from various functions of AguaClara, such as AguaClara Cornell subteams, AguaClara Reach, as well as a panel made up of implementation partners and other similar organizations. The AC Conference hopes to help make the various functions of AguaClara much more cohesive, through the sharing of ideas as well as interactions between members of the various functions. The AC Conference hopes to provide AguaClara Cornell students a broader picture of what happens with their research and how it eventually ends up being implemented in communities around the world. Furthermore, the AC Conference hopes to educate other schools and community members on the mission of AguaClara and what AguaClara has done to help bring safe water to various communities. The conference aims to provide an overview of the technologies and implementation strategies that can be used to provide safe drinking water to more communities. AC Conference 2020 was held virtually on Zoom from 10:00 AM to 12:15 PM on December 5th, 2020.

2) Conference Logistics

2.1) Planning and Advertising the Conference

The first step in planning the conference was to determine the purpose and scope of the conference. Through internal discussions among the subteam, as well as meetings with Monroe and AguaClara Reach members, the team was able to ascertain that a higher level overview of the work of the various AguaClara branches was most beneficial. The presentations would highlight the interconnected work of all of the components of the AguaClara ecosystem. Each presentation would fall under the general purpose of further understanding the technology and organizations required for the implementation of safe drinking water in various communities.

After explicitly stating the conference's objective, its general format and schedule was introduced, allowing the subteam to determine what factors (such as presentations, a panel, breakout rooms) would be included in the conference. The team brainstormed various formats

of presentations, including panels, moderated discussions, general presentations, and breakout discussions. The finalized schedule the team decided on is presented in **Appendix A**.

In addition to weekly subteam meetings to discuss conference progress, a major factor of planning the conference was reaching out to all the implementation partners and others that the subteam wanted to invite as presenters, speakers, and panelists. Communication through email was critical, each subteam member being responsible for a couple of organizations and coordinating their availability updates regarding their participation in the conference.

Lastly, in advertising for the conference, the team worked with the Public Relations team to put together an event program that detailed the schedule of the conference, as well as the speaker and organization biographies. Furthermore, the team members reached out to the Professional Development Chair to extend the conference invitation to all past alumni.

2.2) AC Conference 2020

The AC Conference 2020 schedule that the team decided on can be found in **Appendix A.** The Conference started with introductory remarks by Monroe Weber Shirk of AguaClara Reach. Following Mr. Shirk's remarks, all the participants were put into breakout rooms for 10 minutes to introduce themselves and familiarize themselves with others. After the personal introductions, 30 minutes were allotted for the panel discussion. The panel discussion consisted of a moderator from the AC Conference subteam who asked the implementation partners and similar water treatment organizations questions related to their mission, background, current projects, and future aspirations. Sample questions for the panel are provided in **Appendix B**.

2.3) Feedback

There were four responses in the feedback form that the team had sent out to all participants. Positive feedback included that the conference was well structured, the variety of speakers, the ability to learn about other organizations within the AguaClara ecosystem, and the sense of community that the conference helped foster. Points of improvement include increasing engagement, having a more detailed conference program, following the schedule more closely, and having all participants mute their microphones at the start of the conference.

2.4) Future Improvements

In terms of logistics, there are several improvements that could be made. For one, a clear timeline regarding advertising should be established, along with what materials would be sent to different groups. Furthermore, there should be more emphasis on including more planning prior to advertising or reaching out to speakers to avoid any confusion on the materials needed or the format of the conference. Lastly, more time should be allotted to each speaker to prevent speakers from going over time. The panel portion of the conference should be allotted an hour in the future.

There is also room for improvement on the content of the presentation. The conference should look to incorporate more interactive activities or discussions, or a moderated Q&A with questions from the audience. Future conference organizers can also try having different staples of presentations - not just limited to panels and slideshow presentations. Eventually, the annual conference could incorporate a theme for each year to keep the content novel and exciting.

3) Speakers and Contacts

Presenters:
The speakers' and organizations' biographies are provided in **Appendix C**.

Appendix A. Conference Schedule

AC Conference 2020 Schedule (EST)

This is the original schedule that the team envisioned the conference would follow.

10:00 am - 10:15 am	Introduction and Opening Remarks ● Presenter: Monroe Weber Shirk
10:15 am - 10:25 am	Icebreakers and Personal Introductions

10:25 am - 10:55 am	Panel: Opportunities and Challenges with Safe Drinking Water Technology ● Presenters: Gram Vikas, Agua Para el Pueblo, Agua Para la Vida, 33 Buckets
10:55 am - 11:00 am	Break
11:00 am - 11:10 am	Sustainable Resilience Communities Program Introduction ● Presenter: Patrick Sours, Ohio State University
11:10 am - 11:20 am	Overview of the AguaClara Infrastructure Design Engine ● Presenter: Candela Lencina and Paul Rozzi, Cornell University
11:20 am - 11:30 am	Mechanisms of Particle Removal in Fluidized Floc Blankets and a Fractal Floc Properties Model ● Presenter: Kevin Sarmiento, Cornell University
11:30 am - 12:00 pm	AguaClara Reach: Progress and Future Goals ● Presenters: Zoe Maisel and Matt Cimini, AguaClara Reach
12: 00 pm - 12:15 pm	Closing Remarks

AC Conference Updated 2020 Schedule (EST)

This is the revised schedule that reflects how the event actually progressed.

10:00 am - 10:15 am	Introduction and Opening Remarks ● Presenter: Monroe Weber Shirk
10:15 am - 10:25 am	Icebreakers and Personal Introductions
10:25 am - 11:07 am	Panel: Opportunities and Challenges with Safe Drinking Water Technology ● Presenters: Gram Vikas, Agua Para el Pueblo, Agua Para la Vida, 33 Buckets

11:07 am - 11:18 am	Sustainable Resilience Communities Program Introduction ● Presenter: Patrick Sours, Ohio State University
11:18 am - 11:24 am	Break
11:24 am - 11:34 am	Overview of the AguaClara Infrastructure Design Engine ● Presenter: Candela Lencina, Paul Rozzi, Maitreyi Chatterjee, and Jeff Shen Cornell University
11:34 am - 11:44 am	Mechanisms of Particle Removal in Fluidized Floc Blankets and a Fractal Floc Properties Model ● Presenter: Kevin Sarmiento, Cornell University
11:44 am - 12:14 pm	AguaClara Reach: Progress and Future Goals ● Presenters: Zoe Maisel and Alissa Diminich, AguaClara Reach
12:14 pm - 12:20 pm	Closing Remarks

Overall, the team was able to stick close to the intended schedule.

Appendix B. Panel

These are the questions that the team sent out to the panelists to prepare for. Due to time constraints, only the bolded questions were presented to the panel.

Challenges and Opportunities with AC Technology Implementation

1. Background
    a) **What is the background of your organization? Who does it serve, and why was it founded?**
2. Background
    a) Technology/Implementation

   i. **Where are you currently implementing your technology? Can you quantify the impact?**
   ii. What was the greatest technical challenge during the building of the plants?
   iii. Do the components of the plant work well? How could they be improved?
   iv. What do you wish that the plants could have that you currently do not yet have?

b) Cultural
   i. **Have local communities been receptive towards the building of the plants/the new technologies? What challenges have arisen with regards to this?**
   ii. How have local communities improved since the installation and implementation of safe water plants and technologies?

c) Maintaining ownership of technology
   i. How have local water boards and plant operators contributed towards the success of the plant? What issues were there?

1. Opportunities
   i. **What are some additions to the plants that you wish had been implemented?**
   ii. How would you envision the implementation of more plants in your country?
   iii. **Do you have plans to operate in more cities?**

Appendix C. Speaker and Organization Biographies

The biographies of some of the speakers at AC Conference 2020 are provided below:

Patrick Sours:

Organization Representing: SRC Program at Ohio State University

Patrick Sours has been working on international development projects for the past seven years. This is his fifth year working on the SRC; Maji Marwa Project. He earned a BS in civil engineering and an MS from the Department of Food, Agricultural and Biological Engineering at The Ohio State University, where he focused his research efforts on Sustainable Development engineering. Patrick has extensive field work in international development, in particular, working with rural communities on construction and optimization of water storage. Patrick has also worked on projects in Ohio, Guatemala, Honduras, India, and Ghana.

Daniel Hoop Bio:

Organization Representing: 33 Buckets

Hi, my name is Daniel Hoop. I recently graduated from the Environmental Engineering program at Arizona State University. I'm also an alumni of the Next Generation Service Corps and Barrett, The Honors College at ASU. I currently serve as the Executive Director of 33 Buckets, a 501(c)(3) organization based in Tempe, Arizona. In our short existence as an organization, 33 Buckets has launched clean water and sanitation projects in 14 communities serving over 8,800 people. In the 3 years I have worked with 33 Buckets, I've had the opportunity to travel to Mexico, El Salvador, and Peru with the purpose of empowering communities through long-term access to clean water. Some of my core values are transparency, adaptability, and resilience. I love music, camping, snowboarding, and building relationships!

Matthew Cimini Bio:

Organization Representing: AguaClara Reach

Matt Cimini graduated from Cornell University in 2019 with a B.S. in Mechanical Engineering as well as a minor in Environmental Engineering. He has always enjoyed applying his passion for mechanical design to the field of EnvE. During his time at Cornell, he participated on the AguaClara Cornell team for 5 semesters, starting out as

a member for a fabrication team, then eventually moving onto AIDE to develop the parameterized abilities of the CAD model. Matt was eventually elected as Team Lead his last two semesters at Cornell. Having graduated, Matt now works in Boston, MA for WSP as a mechanical designer; he uses REVIT and AutoCAD to design HVAC systems for large commercial buildings. On ACR Matt works as the RIDE (Research, Invent, Design, Empower) Committee Chair. Together with a 20 person group of current students, AguaClara alumni, and brand new volunteers he works to standardize and propel AguaClara Research across the globe.

Zoe Maisel Bio

Organization Representing: AguaClara Reach

Zoe Maisel has been involved with AguaClara since 2015. As a student at Cornell University, she served as a Team Lead, Research Adviser, and Student Researcher with the AguaClara Program. Since her graduation in 2018 with her Bachelor of Science and Master of Engineering in Environmental Engineering, she has served as a Volunteer Coordinator and a Secretary for the AguaClara Reach Board of Directors. She currently serves as the President of the Board where she works with the Board Directors and volunteers to set the organization's direction and ensure implementation in accordance with the bylaws. Zoe lives in New York and works at Hazen and Sawyer as an Assistant Engineer within the Water Process group.

Kevin Sarmeinto

Organization Representing: Cornell University

Kevin Sarmiento transferred to Cornell University from LaGuardia Community College in 2017 and completed his Bachelors of Science in Environmental and Sustainability Sciences from CALS in 2019. In his second semester of undergrad at Cornell he joined the AguaClara project team where he grew interest in environmental engineering through the impactful and hands-on work done on the team. Since joining AguaClara,

Kevin has been a part of a diverse set of teams which include: Investments, Fluoride Removal, and Public Relations. He also co-led the effort to bring AguaClara technologies to Colombia, where his family immigrated from. As a result of his experiences in AguaClara, Kevin currently pursues a Master's of Science in Environmental Engineering at Cornell University to gain more experience in the field of environmental engineering and carry on with research aimed at making sustainable drinking water accessible to resource scarce communities worldwide.

The biographies of organizations represented at AC Conference 2020 are provided below:

Mechanisms of Particle Removal in Fluidized Floc Blankets and a Fractal Floc Properties Model - Project Abstract

AguaClara has made extensive use of fluidized floc blanket reactors in their design of water treatment plants. Previous AguaClara researchers, such as William Hurst and Casey Garland, have made significant contributions to the understanding of floc blankets, such as demonstrating that floc blanket sedimentation significantly increases particle removal, as measured by turbidity. The mechanisms of particle removal in the floc blanket however remain unclear. This research aims to understand the physics behind particle capture in floc blanket sedimentation reactors. The hypothesis that floc blankets are more effective at capturing primary particles, such as clay colloids, than flocculators and tube settlers alone will be tested by measuring the particle removal efficiency of various particle sizes with particle counters. In addition to this experimental work, a model for predicting the properties of flocs as a function of influent water characteristics, coagulant nanoparticle bond strength, and floc diameter is being developed. This model would allow us to predict downstream processes such as floc blanket concentration and ultimately particle removal efficiencies which is necessary for further optimization of water treatment processes.

Ohio State SRC Program

Sustainable Resilient Communities Program – The Sustainable Resilient Communities Program is a multi-disciplinary community engaged learning organization. The SRC program hopes to enable students to use their engineering skillset to address and respond to the complex challenges of communities, whether that is in Columbus, Ohio or across the globe. The SRC program has been partnering with AguaClara on a water treatment distribution initiative in Tanzania to address the long term water challenges of a rural Maasai community and working closely with AguaClara to expand academic research around providing safe water on tap.

33 Buckets:

33 Buckets started off as a class project at Arizona State University. Today, it is a non-profit organization empowering communities through lifetime access to clean water. 33 Buckets strives to enable underserved communities to achieve prosperity. 33 Buckets builds partnerships with small, rural communities who can often be overlooked due to their small size. They have brought clean water to over 7,100 people and counting in Bangladesh, Peru, and the Dominican Republic. They anticipate exponential growth in the next 5 years and hope to bring clean water to more countries around the world.

APP:

Agua Para el Pueblo (APP), a Honduran non-governmental organization, is AguaClara Cornell's main implementation partner. Through this partnership, 20 plants serving over 77,000 people have been built. APP hopes to increase access to water resources, improving access to safe drinking water and sanitation overall.

Agua Para La Vida:

Agua Para La Vida works with rural communities in Nicaragua to implement sanitation, watershed conservation in gravity powered water treatment facilities. Their facilities operate year-round and have full-time Nicaraguan staff. With a heavy emphasis on training, they have been able to help other communities implement their own water systems. In total, APLV has worked on over 50 projects to implement safe drinking

water in rural Nicaragua. They have also developed open-source software and textbooks to learn more about gravity-powered water treatment systems.

AguaClara Infrastructure Design Engine:

Apps and Algorithms is one of the three main subteams of AguaClara Cornell. Within Apps and Algorithms, AIDE strives to develop the first open-source design engine. AguaClara Engineers will then be able to use the design engine to build water treatment plants throughout the world. The engine takes in parameters to create an OnShape drawing and a report that documents the design. The development of this design engine is implemented through the use of Python, Onshape, and FeatureScript.

Gram Vikas:

Gram Vikas is a rural development organization working with poor and marginalized communities of Odisha since 1979. Since 1995, Gram Vikas has been implementing a community-based sanitation and water supply programme, in which each family in the village builds its own toilet and bathing room and the village builds a piped water supply system. MANTRA (Movement and Action Network for Transformation in Rural Areas) is the overarching framework of Gram Vikas' development initiatives.

As we enter into our fifth decade of operations, Gram Vikas has prepared its new strategic and programmatic approach, named Gram Vikas Decade V, to help deepen our work with the rural communities in Odisha and Jharkhand. Gram Vikas' MANTRA approach to dignified quality of life, with access to safe water and sanitation as the entry point, promotes community ownership and management capabilities to build, own and manage village level water and sanitation infrastructure and services. The Decade V programmes will help build upon the results already achieved and also expand into new areas.

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