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Impact of COVID-19 on a Participatory Action Research Project: Group-Level Assessments With Undergraduate Women in Engineering

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Abstract

We have been working with undergraduate women in engineering to assess their experiences on campus and during their co-op rotations in order to influence equitable programming and inclusive practices at our institution. Our main methodology is group-level assessment, a qualitative, participatory research method that is rooted in inclusivity, stakeholder engagement, and instigating actionable change. When our university went remote, we were faced with the challenge of transitioning our community research partnership online and continuing to use our chosen method. The current article compares participant experiences in in-person and remote environments to assess the effectiveness of moving our participatory research practices to an online platform. Findings indicated that although both in-person and virtual group-level assessments allowed participants to better understand others' experiences and allowed their voices to be heard, the in-person method was more engaging. However, the virtual method allowed more time for action planning.

Keywords: participatory action research, community-based participatory research, group-level assessment, participatory methods, women in engineering, higher education

As participatory action researchers during the COVID-19 pandemic, we struggle with maintaining meaningful collaboration with our community partners while navigating social distancing guidelines. Because community-based participatory research relies heavily upon authentic connection and communication with coresearchers (Lindquist-Grantz & Vaughn, 2016; Vaughn, Jacquez, & Zhen-Duan, 2018), lockdowns and quarantines have been challenging obstacles to overcome as we continue attempting to implement participatory research methods while maintaining the integrity of our projects. Research progress overall at Research-1 institutions, like our university, has been significantly impacted by pandemic restrictions (Harper et al., 2020; Omary et al.,2020).

For the past several years, we have been working with undergraduate women in engineering (UWiE) at a large, public, midwestern research university to assess their experiences on campus and during their co-op rotations in order to influence equitable programming and inclusive practices at our institution. We have been primarily using group-level assessment (GLA), a qualitative, participatory research method that is rooted in inclusivity, stakeholder engagement, and instigating actionable change (Arthur & Guy, 2020; Guy, 2020; Guy & Boards, 2019; Vaughn & Lohmueller, 2014). When our university went remote, we were faced with the challenge of transitioning our community research partnership online and continuing to use our chosen method.

The current article seeks to compare participant experiences in in-person and remote environments to assess the effectiveness of moving our participatory research practices to an online platform. We will analyze data from coresearcher reflections on the GLA process pre- and postpandemic, in addition to semistructured interview data and researcher reflections, in order to determine whether transferring the method online was effective in terms of factors such as authentic dialogue, participant engagement, and inclusivity. We will also include our own reflections upon the success of the techniques.

Authors' Positionalities

Batsheva's Positionality

I am a participatory action researcher specializing in participatory qualitative and arts-based methodologies. When the pandemic hit and universities went remote, my first thought was how my collaborators and I would be able to maintain meaningful relationships with our coresearchers and community partners. Luckily, unlike many instructors making the switch to online environments, I already had experience teaching online and conducting research virtually. In 2016, I hosted an online GLA with STEM faculty focused on active learning in the classroom (Guy, 2017). Although this GLA was not as engaging as I would have liked it to be, I never made the time to revisit its outcomes to explore how it could have been improved. Our unexpected remote situation became an opportunity for testing a new method for hosting online GLA.

Brittany's Positionality

As a doctoral student I was set to conduct my dissertation research in summer 2020. After the reality of the pandemic set in, I quickly realized that my original plan of facilitating a participatory qualitative research study was going to look different than I had originally imagined. One of the beautiful aspects of using participatory methods is that they are flexible, and GLA is no different. Through deep reflection and conversations with advisors/colleagues, I created a process to bring GLA to life in a virtual setting, with the hope of remaining as authentic to an in-person offering as possible. I deeply believe in the empowering aspect of using thoughtful participatory approaches, and I tried to be very intentional on maintaining that component in an online framework. As a participatory researcher, I believe we must continue to explore ways to bring our approaches, frameworks, and methods to life in virtual settings, to ensure we continue to meet the needs of our communities.

Method

Prepandemic, we hosted three in-person GLAs between the spring and fall of 2018 with UWiE on our university's campus. Although our plans to hold an additional series of GLAs were thwarted by COVID-19 restrictions, we worked to transfer the method to an online environment and held two more GLAs in spring 2020. In this article, we outline the process of the in-person, traditional GLAs, and explain how we modified the process to work in an online modality. We detail our methods for collecting and analyzing the three sources of primary data for this article: (a) participant reflections post-GLA, (b) semistructured interviews, and (c) researcher memos and reflections. The reflection responses and semistructured interview data in conjunction with researcher reflections serve as the primary sources of data for this study. The responses to the GLA prompts, which were collected and analyzed for a separate research study, are not the salient source of data for the current study. This research project was designated as nonhuman subjects research (exempt from review) by our institution's IRB.

Participants

Participants consist of UWiE students at our university. Participants were recruited via email through a filtered mailing list. The spring, summer, and fall 2018 GLAs included 31, 39, and nine participants (n = 79), respectively, and the two online GLAs included 15 and 13 participants, respectively (n = 28). Two participants from the in-person GLAs also participated in the online GLAs and were invited to participate in semistructured interviews. UWiE were able to participate in one of the 2018 GLAs and one from 2020 because the former focused on general experiences and the latter on participation in cooperative education.

In-Person GLA Method

GLA, like most participatory methods, is traditionally carried out in a face-to-face environment. The purpose of a GLA, in general, is to gain information on a specific

topic or issue from a group of stakeholders and work with the stakeholders to create an action plan that will address issues that arose during the process (Vaughn & DeJonckheere, 2019; Vaughn, Jacquez, Deters, et al., 2020). For our specific research project, we conducted GLAs with UWiE in order to better understand their experiences on campus and during cooperative education. The GLA process we implemented involves seven phases, or steps:

1. **Climate setting**: An in-person icebreaker is facilitated.
2. **Generating**: Participants respond to written prompts throughout the room that are posted on the walls.
3. **Appreciating**: Participants walk around the room and read all prompt responses. They draw a star (*) or checkmark (✓) next to the responses they agree with.
4. **Understanding**: In small groups, participants determine themes across an assigned set of prompts.
5. **Selecting**: As a large group, the facilitator guides participants in sharing and consolidating themes.
6. **Action**: The facilitator guides the participants through creating an action plan based on the final themes.
7. **Reflecting**: Participants individually respond to reflection prompts on paper. (Adapted from Vaughn & Lohmueller, 2014)

Online GLA Method

Because the traditional GLA method is hosted in person, we had to make several modifications for the process to run efficiently in a virtual environment, including rearranging some of the phases. Table 1 illustrates the differences between the in-person and online GLA methods, including the variations in the order of the steps.

Reflections

Following the in-person GLA, participants completed an exit survey in which they responded to three reflection questions:

Table 1. Comparing In-Person and Online GLA Phases

GLA Phase	**In-Person GLA**	**Online GLA**
Phase 1	**Climate Setting**: In-person icebreaker facilitated.	**Generating** (pre-online GLA): Participants type their responses to prompts in an online survey.
Phase 2	**Generating**: Participants respond to written prompts throughout the room.	**Appreciating** (pre-online GLA): Participants read everyone's responses in a shared document and type an asterisk (*) next to the responses they agree with.
Phase 3	**Appreciating**: Participants walk around the room and read all prompt responses; they draw a star (*) or checkmark (√) next to the responses they agree with.	**Climate setting**: Online icebreaker facilitated in the main room of a video conferencing software.
Phase 4	**Understanding**: In small groups, participants determine themes across an assigned set of prompts.	**Understanding**: In small group breakout rooms, participants determine themes across an assigned set of prompts.
Phase 5	**Selecting**: As a large group, the facilitator guides participants in sharing and consolidating themes.	**Selecting**: As a large group in the main room, the facilitator guides participants in sharing and consolidating themes.
Phase 6	**Action**: The facilitator guides the participants through creating an action plan based on the final themes.	**Action**: The facilitator guides the participants through creating an action plan based on the final themes.
Phase 7	**Reflecting**: Participants individually respond to reflection prompts on paper.	**Reflecting** (post-online GLA): Participants individually reflect upon their experiences in a post-GLA survey.

1. How did participating in the GLA change your perspective?
2. What did you enjoy about this process or what would you change?
3. Is there anything else that we didn't cover that you would like to add?

Following the virtual GLA, participants were asked to respond to the following reflection questions, including two additional questions about the virtual format:

1. In a few words, what are your initial thoughts after participating in the GLA?
2. How do you feel that the virtual format of this GLA impacted your overall experience?
3. What did you enjoy about this overall process or what would you change?
4. Did participating in the GLA change your perspective? If yes, how?
5. Is there anything else that we didn't cover that you'd like to add?

We analyzed the collective responses to the reflection questions using summative content analysis to compare and contrast the GLA reflections (Hsieh & Shannon, 2005) through the following steps:

1. **Keywords**: Following an initial readthrough of the reflection responses, we determined salient keywords across each reflection type (in-person versus online reflection responses).
2. **Counting**: We then counted the frequency of the keywords in each reflection type.
3. **Coding**: Next, we determined a series of codes and, subsequently, overarching categories based on the keywords.
4. **Comparison**: Finally, we compared keywords and codes from the reflections between the two types of GLAs.

Interviews

We conducted semistructured interviews (Brown & Danaher, 2019) with two participants who engaged in both an in-person GLA *and* an online GLA. The interviews were intended to better understand the differences between participants' experiences of the two types of GLAs, particularly in the context of authentic dialogue, engagement, and inclusivity. The following questions were used during the interviews, with follow-up questions as needed in accord with the semistructured style as described in Brown and Danaher (2019).

1. How was your experience with the in-person GLA different from the virtual one? How were they similar?
2. What do you feel were the strengths and weaknesses of the in-person GLA compared to the virtual GLA, and vice versa?
3. Which GLA process do you feel allowed for more authentic dialogue? Please explain your answer.
4. Which GLA process do you feel had higher participant engagement? Please explain your answer.
5. Which GLA process do you feel was more inclusive? Please explain your answer.
6. Is there anything else you'd like us to know about your in-person and/or virtual GLA experience?

Half hour interviews were conducted, recorded, and transcribed via video conferencing software.

We analyzed the interview transcripts using the constant comparison method of qualitative data analysis (Maykut & Morehouse, 1994; Memon et al., 2017), using procedures adapted from Memon et al. (2017):

1. **Initial coding**: We identified repeated schemes following the two interviews.
2. **Stage 1, Inductive category coding**: We created a list of initial categorizations following the primary review of the interview transcripts.
3. **Stage 2, Refinement of categories**: Next, we finalized inclusion rules for the categories and developed an initial coding system.
4. **Stage 3, Exploration of relationships across categories**: We then continued to organize the codes into final groupings.
5. **Stage 4, Integration of data**: The final step involved synthesizing the codes and finalizing the themes from the interviews.

Researcher Reflection

Following each GLA, we hosted reflective discussions with one another in person (prepandemic) and via online video conferencing software (during COVID-19 restrictions) to share how we felt the process went, what could be improved, and to perform initial reviews of the data. We then used memoing as an analytical strategy to further pull meaning from the data sets and our own experiences, and as a "tool for conducting a comparative analysis" in the case of the current study (Birks et al., 2008, p. 71). In general, we utilized memoing to achieve the following goals, as outlined in Birks et al. (2008):

1. **Reflecting**: Determine what the findings mean for us and our research
2. **Summarizing**: Create summaries of the data in our own words
3. **Extracting**: "Extract" meaning from the data (p. 70)
4. **Comparing**: Compare data from each set

Integrative Analysis

Following the summative content analysis of the semistructured interviews, constant comparison analysis of the reflections, and analytic memoing of our own reflections, findings were combined and consolidated using an integrative analysis (Bazeley, 2011; Creswell & Clark, 2017). The purpose of integrative analysis is to triangulate findings from analysis of multiple types of qualitative data sets (Bazeley, 2011)—in this case, the findings from participant reflections, semistructured interviews, and researcher reflections. Figure 1 provides a visual of the analyses of the three data types.

We carried out the integrative analysis following the below procedure as adapted from Bazeley (2011):

1. **Analyzing**: Analyze data from multiple sources separately
2. **Coding**: Determine overlapping themes and create consolidated codes/categories

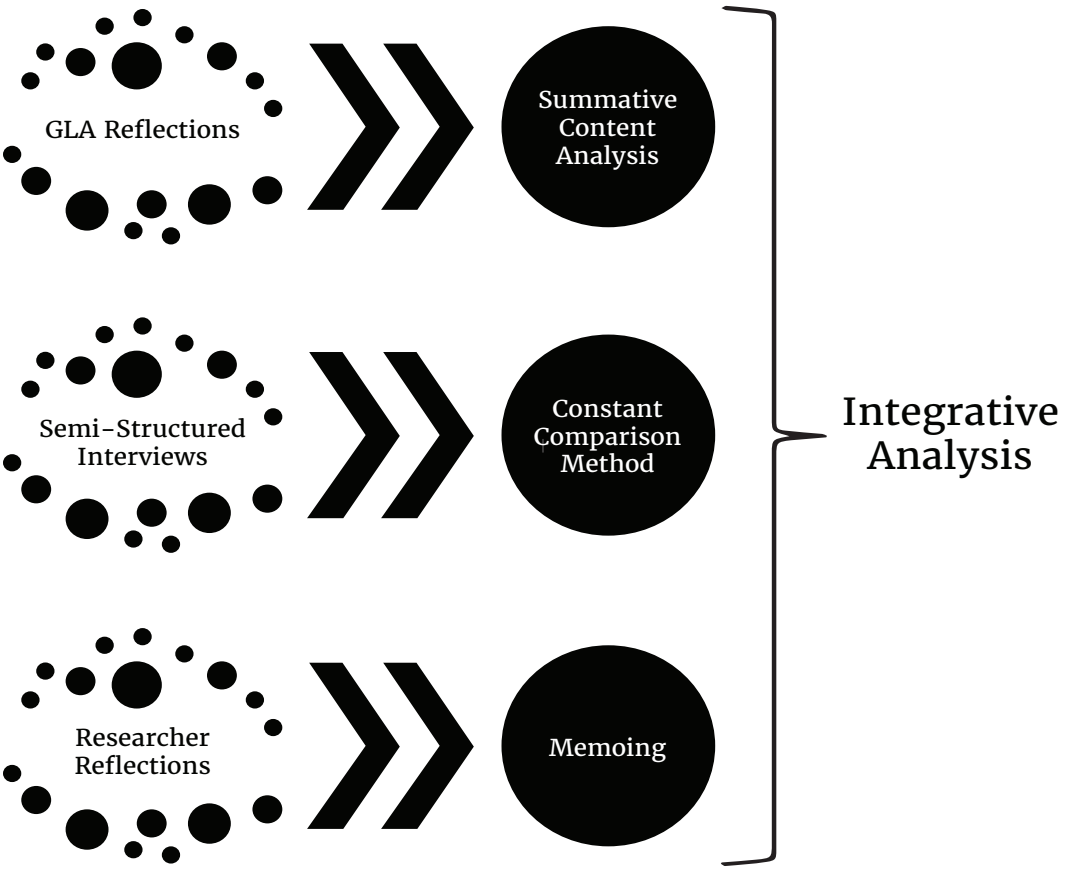

Figure 1. Integrative Data Analysis

3. **Consolidating**: Address divergent, or inconsistent, findings
4. **Finalizing**: Finalize overarching themes

Below we detail the results of the final themes extracted via the integrated analysis.

Findings

Following the analysis of each data source and the combined integrative analysis, the following themes emerged in comparing the experiences of the in-person to the online GLAs: (1) awareness of others' experiences, (2) voice heard, (3) connection and engagement, and (4) potential for change. Themes 1 and 2 capture similarities between the two methods, whereas Themes 3 and 4 illuminate key differences.

Theme 1: Awareness of Others' Experiences

A similarity between the in-person and virtual GLAs involved participants' feelings that as a result of participating they became more aware of other women's experiences in engineering. In both types of GLAs, the women felt they understood more about their peers' experiences and also appreciated hearing about others' experiences. As one woman from an in-person GLA explained, "It made me aware of other females experiencing the same issues and other issues we struggle with that I haven't experienced." This sentiment is reflected in comments from a virtual GLA participant who shared that it was "nice to hear from a variety of people about their experiences, not just people you are personally connected to. It gives some validity to my experiences to know others have encountered similar problems." Both the in-person and virtual GLA participants felt that process helped them gain "insight" and "learn more" about other women's experiences and better "understand . . . the problems they face." An in-person GLA participant explained that "it made me realize that many other women in engineering feel the same way I do," and a virtual GLA participant described learning about other women as "eye-opening."

Theme 2: Voice Heard

Another similarity between the types of GLAs was that the women felt that their voice was heard in both experiences. As an in-person GLA participant succinctly explained the sentiment: "I feel like my voice is being heard." A woman who participated in the virtual GLA felt the same way: "It was . . . nice to have my voice heard and be able to listen to other women in engineering passionate enough about this to take time out of their day to contribute." Not only did the women in both GLAs express feeling heard, they also felt valued, sharing that the GLA "made me feel understood" and "showed me that my concerns have validation." Another participant indicated, "I felt like my experiences and thoughts were listened to and cared about." One of the interviewees agreed that feeling her voice was heard was equal in both types of GLA, and she shared that she thought "people still were able to have their voices heard" during the virtual session.

Theme 3: Connection and Engagement

A difference between the in-person and virtual GLAs was the level of connection and engagement. Although the in-person GLA reported high levels of connection with other participants and engagement in the process, the virtual GLA fell short. In person, participants felt they were in a "very supportive environment." The women shared that they "enjoyed feeling open and talking about experiences." Participants in the in-person GLA described the GLA as "fun and interactive!" and "very collaborative."

On the other hand, although some participants in the virtual GLA explained that they felt connected when people turned on their video and that "the virtual format was just as good as face-to-face," many participants felt the online experience was less personal and "not as natural as an in-person conversation." Many of the participants also reported issues with the flow of the session, indicating that "it was a little slow to transition on time" and "I think conversation would've flowed easier and been more collaborative in person." That said, a few of the women did appreciate the small group breakout sessions, sharing that "the breakout rooms were particularly useful," with one woman explaining that she "immediately [felt] more connected with my female engineering peers and like a part of a big group of confident women."

The interviewees, who attended both the in-person and virtual GLAs, confirmed the sentiment that the in-person GLA was more engaging. The first interviewee explained

that "it was definitely just a little bit different not to be able to see everyone's face and see the, like, physical themes and Post-it notes together." The second interviewee agreed, saying that "literally seeing other peoples' responses, even if I didn't know who they were, made me feel more comfortable in the situation [than] with the survey."

Theme 4: Potential for Change

Although the virtual GLA was less engaging than the in-person session, the virtual GLA allowed for more discussion about action items due to more flexibility with time, as the generating phase was completed ahead of time. The women in the in-person GLA acknowledged the time constraints, in that they wished there was more time to "focus on action items." Another woman felt the same way, expressing she wished there was "more time for talk and action items." One of the interviewees shared: "I definitely appreciated in the virtual one that it saved us quite a bit of time and we had more time to just discuss the themes in the action items."

The same sentiment was expressed by the other interviewee, who said that "the virtual GLA did a really good job of generating more action items." The virtual GLA participants were in agreement, as one woman shared that the "GLA showed me that change can come from discussion and sharing experiences," and another expressed that "I really enjoyed that we helped to come up with action items." One participant was surprised, saying, "It was far more productive than I was expecting."

Discussion

In summary, key themes that arose in comparing experiences between the in-person and online GLAs included (1) awareness of others' experiences, (2) voice heard, (3) connection and engagement, and (4) potential for change. These findings demonstrate that although there are similarities in the two methods, each has clear pros and cons. Both in-person and online GLAs helped make participants aware of their peers' experiences, as well as made them feel validated and that their voices were heard. That said, connection and engagement between participants and with facilitators were higher during the in-person GLAs. A strength of the online GLAs, on the other hand, was the increased time available to focus on action items.

Limitations

The primary limitation of the current study was the difference between the number of participants in the in-person GLAs (n = 79) versus the online GLAs (n = 28). This discrepancy could be overcome in the future as we host more online GLAs and continue to gather reflections. Additionally, because only two participants engaged in both types of GLA, we were able to conduct only two semistructured interviews. However, as we combined and triangulated several sources of data, we were able to maintain reliability.

Future Directions

Even as social distancing restrictions are lifted, what we have learned from hosting online GLAs can continue to benefit community-based research. Conducting GLAs in a virtual environment will allow GLAs to be facilitated across time zones and locations. Online GLAs could open up the doors for more efficiently conducting international, interdisciplinary research. Virtual collaboration within communities across countries and cultures could open new doors in the realm of participatory research. In the specific context of our work with UWiE, a future study could involve hosting virtual GLAs across the United States at similar universities (large, public, urban R1 institutions) and comparing the experiences of UWiE. Without the barrier of location, we could engage even more women at a variety of comparable institutions. A study gathering data on UWiE across universities would allow multistate participants to collaborate on action items. Such a study could instigate a nationwide call to action for gender-equitable programming in engineering and even the creation and implementation of tailored programming at multiple institutions *for* UWiE, *with* UWiE, empowering women at multiple universities.

Furthermore, the techniques we implemented and lessons we learned developing the online GLA process could be translated to a variety of participatory research methods, such as photovoice (Wang & Burris, 1997), future creating workshop (Raider-Roth et al., 2021), and action interviews (Nielsen & Lyhne, 2016), to name a few. Implementing an online version of photovoice would allow us to capture a variety of voices in a creative way while empowering women to develop their own research questions, implement

a hands-on approach to collecting data, and develop action items to empower and instigate positive change (Duffy, 2011). We would tailor Sutton-Brown's (2014) methodological guide to photovoice into an online environment.

The principles we applied to move traditional GLA to an online environment can also be utilized when implementing a multitude of additional methods and research techniques virtually. Moving more traditional qualitative methods—for example, focus groups and interviews—online could also be a beneficial future direction. As participatory researchers we must continue to explore and research how our approaches can translate into an online format, to ensure the integrity of the approach is maintained.

Implications

Utilization of participatory research methods in an online environment has implications far beyond our single study with UWiE. Online implementation of community-based participatory research both during and after the pandemic could have wider health and well-being applications, such as addressing how communities and individuals are coping as a result of the pandemic itself. Therefore, larger groups within communities can be empowered to suggest action items that could be implemented to serve communities in a targeted way during COVID-19. For example, Nguyen et al. (2020) implemented community-based participatory research to respond to community needs during the pandemic, and Wild et al. (2021) used a participatory research project to communicate COVID-19 health information to communities. Moving aspects of participatory research projects to an online format can reach higher percentages of populations in underserved communities, and enable implementation of action items to improve health outcomes during the COVID-19 pandemic, when these communities are at their most vulnerable.

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