

Reflections on Implementing Participatory Action Research in Engineering

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Abstract

Participatory Action Research (PAR) is a research approach that utilizes collaborative relationships between researcher and stakeholders in order to solve a problem and generate knowledge (Coghlan & Brannick, 2010). Within the engineering space, PAR is beginning to gain steam and approval as a valid approach to research. More specifically, PAR is an ideal approach to understanding the experiences of marginalized populations. It can be argued that PAR methods and more feminist approaches are necessary within an engineering context, if we hope to make progress in regard to equity and inclusion in the engineering field. This paper provides an overview of PAR, while also discussing the need for positionality and reflection embedded in the research process. Each of the authors share a narrative reflection on their experiences within the PAR space and the challenges that accompany the action implementation phase of PAR. Additionally, example action items from a recent study are shared to provide context to the feasibility of PAR action. The goal of this paper is to raise awareness around PAR as a preferred approach when working with marginalized populations and the necessary resources researchers need to execute action items.

Keywords: feminist qualitative research, participatory action research, women in engineering, engineering education

1. Introduction

1.1 Participatory Action Research (PAR)

PAR challenges structures of power, by creating opportunities for communities to participate in the creation of innovative and effective solutions. The PAR tradition affirms “the notion that ordinary people can understand and change their own lives through research, education, and action” (Brydon-Miller & Maguire, 2009, p. 81). A main goal of PAR is to empower individuals who experience powerlessness to “use their own knowledge” to create action and change in their community (Coghlan & Brannick, 2010, p. 45). PAR is more of a stance than a methodology, stressing the importance of the research process and inclusion of participants (Herr & Anderson, 2015).

PAR is grounded in the lived experiences and knowledge of the participants (Wicks, Reason, & Bradbury, 2008). The “enlightenment and awakening of common peoples” (Fals-Borda & Rahman, 1991, p. vi) has been mentioned as being the primary role of PAR. By emphasizing collaboration, specifically within oppressed communities, PAR strives to confront the causes of injustice and inequality, while focusing specifically on finding solutions (Williams & Brydon-Miller, 2004).

The PAR approach places a great deal of emphasis on the collaboration with participants, with collaboration being an overarching value throughout the entire research process. PAR requires the respect of people, acknowledging the experiences and knowledge that people bring to the research process (Brydon-Miller, Greenwood, & Maguire, 2003). Power sharing changes the dynamic of the research as it allows for research with the community as opposed to on the community. The PAR process is a collaborative experience, with the intent of creating transformative change through a commitment to action (Brydon-Miller & Maguire, 2009).

Coghlan and Brannick (2010) explain that PAR “has a subversive quality about it. It examines everything. It stresses listening. It emphasizes questioning. It fosters courage. It incites action. It abets reflection, and it endorses democratic participation” (p. 35). PAR strategies have two objectives: (1) “produce knowledge and action directly useful to a group of people” (Reason, 1994, p. 12), and (2) empower participants by increasing self-awareness through reflection and self-inquiry (Reason, 1994). The benefit of PAR is that it lends itself “to the emergent processes of collaboration and dialogue which empower, motivate, increase self-esteem, and develop community solidarity” (p. 15).

Because PAR is participant-led and focuses on social justice and change, it paves the way for equitable research practices when working with marginalized populations (Málovics, 2021). Providing communities that have historically been oppressed with the opportunity to reclaim their stories, knowledge, and experiences—this is the beauty of PAR. Empowering communities to own their lived experiences and take action on behalf of themselves and their community—this is the power of PAR (Budig et al., 2018).

PAR is research “in real-life action” causing it to have a great deal of messiness and unpredictability (Coghlan & Brannick, 2010), due to the nature of collaborating with people in community to create real change. Although fostering positive change and instigating action is a key tenet of PAR, the execution of action is rarely critically discussed in the literature, and, furthermore, it is difficult to reach the point of action and determine how to measure it (Reid et al., 2006). The definition of action in itself is nuanced and tricky to determine, leading to challenges in understanding exactly when action has been reached or completed (McIntyre, 2008; Reid et al., 2006). According to Guy et al. (2019), approaching the action phase is difficult in that it relies on engagement, having realistic expectations, and agreement in the team on when to officially begin the ‘action’ and how to determine when that has happened.

In the landscape of prior research on PAR, several studies have made significant strides in understanding the dynamics of implementing PAR. However, a critical examination of these earlier works reveals certain limitations that warrant acknowledgment. Many of the previous studies tended to focus primarily on the process but they are potentially overlooking the nuance of action implementation especially the interplay of policy and practice in STEM, especially in engineering. Building upon these insights, our current paper aims to provide insight on the action steps. We discuss the challenges and limitations of action step implementation using reflection, allowing us to provide insider knowledge of PAR. Furthermore, our paper details the experiences with multiple points of view of higher education professionals, an administrator, professor, and staff member. By reflecting on our experiences, we contribute to the field by providing a more complete understanding of PAR and its intricate mechanisms. In the current paper, we discuss our experiences on implementing actions and the challenges that arise as a result, as well as outline actions we have taken in our own PAR work.

2. Methods

2.1 *The Importance of Reflection & Positionality: Feminist Qualitative Research*

Olesen (2005) highlights that within feminist qualitative research we must reflect on “the nature of research, the definition of and relationship with those with whom research is done, the characteristic and location of the researcher, and the creation and presentation of knowledge” (p. 238). Feminist researchers must accept that conducting feminist research is taking an ethical and political stance (McHugh, 2014), by seeking social justice and challenging social biases (Jaggar, 2008). Qualitative research methods are preferred by many feminist researchers because they allow marginalized groups “to have a voice and to impact the conduct of research” (McHugh, 2014, p. 145). In doing feminist qualitative research we must analyze our values and positionality, acknowledging that objective and unbiased research is not possible (McHugh, 2014). Within feminist qualitative research the voice of the participants is most often the focus, however the researcher is also invited to reflect on their positionality throughout the process (Martin et al., 2022, McHugh, 2014).

Feminist research grew out of a need for research practices and methods that do not “produce, promote, or privilege sex/gender inequalities” (McHugh, 2014, p. 137), but that actively “puts gender at the center of one’s inquiry” (McHugh, 2014, p. 137). After recognizing that traditional research approaches are biased and can contribute to the disenfranchisement of women, feminist research grew. More traditional experiments replicate the power dynamics that exist in our social and institutional settings (McHugh, 2014), where the interest of the researcher dominates over the interests or wellbeing of the participant (Unger, 1983). Hubbard (1988) helps us understand why prior research approaches may be contributing to bias and sexism by stating, “by claiming to be objective and neutral, scientists align themselves with the powerful against the powerless” (p. 13). Feminist research is designed to examine the gendered context of the lives of women, advocating for social change, exposing gender inequalities, and empowering women (McHugh & Cosgrove, 2002). Letherby (2003) highlights,

feminist research has a “political commitment to produce useful knowledge that will make a difference in women’s lives through social and individual change” (p. 4).

However, we must recognize that feminist research cannot be described by any singular epistemology, method, or position (Jaggar, 2008a). But rather, feminist research is an approach to research that “seeks knowledge for the liberation and equality of women” (McHugh, 2014, p. 138). Additionally, feminist research is unique in that it is dedicated to creating gender justice in the knowledge creation process (Jaggar, 2008a). Hawkesworth (2006) captures three commitments of feminist research, “to struggle against coercive hierarchies linked to gender (and other statuses); to revolt against practices, values and knowledge systems that subordinate and denigrate women; and to promote women's freedom and empowerment” (p. 7).

3. Results

3.1 Reflection and Positionality on Implementing Action

As Participatory Action Researchers we include a reflexive process throughout our research study. Each of these narratives highlight the benefits and challenges of doing PAR from three different perspectives-- an administrator, a faculty member, and a staff member. Although we highlight challenges in these narratives, we would be remiss not to mention that we deeply believe in PAR and its ability to empower participants and generate actionable knowledge and change.

3.1.1 Administrator Perspective

As a campus administrator, I believe that action-based research is more intentional in gathering data than our traditional qualitative methodologies. We are able to find codes and themes that can help our researchers understand on the surface level what may be happening. Utilizing action-based research allows us to dig deeper into the stories of those who are being impacted. It helps center the population and develop action steps on how to move forward. It has not been adopted into the engineering education field. As a result, we are missing richness in our data.

As we work with students from marginalized groups to document their experience, we often force them to relive traumatic experiences multiple times from participating in focus groups. These focus groups are generally well-intentioned as the goal is to identify hostile campus climates as well as areas of micro aggressive and harassing/threatening behaviors. Participants are asked to relive and reshare their traumatic experiences multiple times, for the purposes of data collection. While data is collected, little action is taken in response to the outcomes. This further retraumatizes students, as they believed sharing their stories would bring change, however, they do not see change in the climate. To adequately prepare to do or conduct a participatory methodology you need to have adequate time allotted to the project. The timeline is generally longer than a one or two session interview or focus group. It takes planning coordination. Oftentimes, due to the length of time needed to conduct proper methodology, researchers turn to other, more time-effective methodologies. To improve the climate on campus, it means that university administrators, deans and department heads must be willing to listen to the outcomes that represent the voices of their students. Once these voices are heard, it is critical that leadership take action steps to change the culture. They need to accept and adopt change at the highest levels and present the changes from top down to their faculty, staff and students. Because participatory research ends with action items developed by populations who are impacted, they should be easily implemented. However, because the methodology is not well understood and accepted in engineering, we are slow to implement changes that come directly from the populations. Participatory methods are becoming more accepted in the field of engineering education and as time goes on I am hopeful that our understanding will evolve as we have learned that we can make great changes by working with the very populations we choose to study, not only to develop solutions but also to build trust. We are working with marginalized populations to get their stories and input on how they would like the field to evolve and grow. Instead of doing things to people we have the opportunity to get to work in concert with people to understand the structural obstacles and barriers that are preventing some from thriving in engineering.

3.1.2 Faculty Perspective

I deeply believe in the power of Participatory Action Research. I believe in the process and I believe in the results it yields. However, I’m hyper aware of the inferiority that PAR experiences compared to more traditional methods. I find myself not only being mindful of this, but constantly trying to combat it by methodically making all the “right” moves when conducting research. Over the past several years I have progressed in various PAR studies. The work is invigorating, but also time intensive and at some points emotionally exhausting. The beauty (and curse) of PAR is that it is messy, but with the messiness comes the celebration that life is also messy.

Working with people is messy and we don't fit neatly into small boxes. The messiness and embracing it allows for the beautiful end result of any PAR study. Facilitating PAR research requires that we make our voice as the researcher small, in order to leave ample space for the voice of our participants. This practice takes a significant amount of reflection and self-awareness at every step of the research process, to ensure I in fact am mindfully removing myself wherever possible.

Each time I facilitate a PAR study I'm always blown away by the participants and their willingness to use their imagination and expertise to solve problems. The action items developed through the process are always so moving, most often I think to myself "duh" of course that is a great solution. Again, the beauty of PAR is bringing the problem to the stakeholders experiencing it and empowering them to come up with the solutions. Although the process itself can be exhilarating and eye opening, the implementation phase can be slow and frustrating. As an academic I am mindful of the snail's pace that higher education can display, this slower pace can also be the reality of the implementation phase of a PAR study. It's important to help your participants/co-researchers through the slowness, to ensure that although implementation may be slow, momentum should not be lost or defeat accepted. Attention should also be paid to which action items to work to implement first. Being mindful about order of operations/implementation can be critical to success. Taking the time to build relationships and allies can also assist with the speed in which action items can be accomplished.

3.1.3 Staff Perspective

Participatory Action Research is many things-- it is inclusion, it is empowerment, it is action, and I find the process to be beautiful, impactful, and powerful. That being said, as a Participatory Action Researcher, I feel as if I am constantly arguing for and defending the legitimacy of the work, while concurrently executing complex, messy PAR processes. Although PAR is becoming more widely accepted within higher education, it is a slow acceptance. Even within the field of educational studies, PAR is seen as inferior in comparison to more traditional, positivist methods of carrying out educational research. Compounded with attempting to do PAR in a STEM space that is historically very white and very male, fighting for the process is exhausting and sometimes demeaning. But, at the end of the day, I believe in the impact of PAR and the action that can come from it, and so I persevere. I tailor my presentations to include as much empirical data and quantitative measures as possible. I focus on creating positive programmatic changes in a way that is efficient and fiscally responsible. At times, working towards change and implementing action items requires choosing the 'low-hanging fruit' of action, so to speak, building my case of the effectiveness of said action, and moving forward with more impactful action and larger 'asks'. The process is long, cyclical, iterative, and rigorous to the point of exhaustion, but it is worth it in the long run when action is implemented and positive change is made. That said, as a staff member in STEM-focused academic spaces, engineering nonetheless, with a shaky background in STEM at best, the imposter syndrome is real. I feel my expertise is constantly challenged by the ideals and perspectives of engineers who resist acknowledging their own privilege and believe they are the elite of the elite among STEM fields. I do not want to discount the expertise of engineering faculty, but I also seek to make them understand that I have my own expertise, as well. In my time working with informatics and engineering faculty, I have been told that my PhD isn't a 'real' degree, that my research is soft, that it's inferior, and that it isn't scientific or rigorous. I've also been brushed off in faculty spaces as a staff member, making me feel as if I am a second-class citizen amongst faculty and administrators, despite my degrees and experience. As such, being told such demeaning things about my work and identity as a Participatory Action Researcher is degrading and discouraging to say the least. Despite everything, I persevere. I deeply believe in the impact of PAR, with the understanding that traditional scientific methods leave out the voices of our marginalized and underserved populations. I seek to inform others about PAR processes, and seeing is believing. I once hosted a participatory method during a Biomedical Informatics faculty meeting, and was told by 'that guy' -- that one white, male faculty member that always has an opinion and has to shout it any chance he gets -- that "this is silly-- can't you just send us a survey?" I felt the blow, but maintained composure. I shared evidence-based data about the legitimacy of PAR, provided concrete data, and shared my own successes. He huffed, but seemed impressed and surprised that I came back with hard facts. After carrying out the method, I received an email from that same faculty member thanking me for carrying out the process, singing my praises, and apologizing for his crassness. While this was a win, it took a battle to get one person to see the value in my work. Being a Participatory Action Researcher requires me to be constantly informed and well-versed in current data and trends, and keep these in my back pocket, in order to prove the validity and significance of the work. Again, it is worth it when you see the work in action, whether it be programmatic change, seeing students excited about participating and highlighting their individual voices, or empowering the community to take research into their own hands.

3.2 Examples of PAR Action Items

To provide context to those unfamiliar with PAR, we’ve included examples of action items developed from our most recent study that used Group Level Assessment to explore the experiences of women engineering students participating in cooperative education. In conducting PAR studies, the action is an essential part of the work and action items are developed in collaboration with the involved stakeholders (participants). The action items developed through our study can help co-op institutions and co-op employers make impactful changes to better support women co-ops in engineering. In figure one below, you will find the determined action items from our work; the following sections details which actions were already taken and how we reached those goals.

Table 1. Action Items Developed

Stakeholder	Action Items
Employers	Encourage students to become socially involved with colleagues and in the company
	Educate employees on working within a multigenerational workforce
	Assign both a supervisor and mentor to co-op
	Give women the option to have a male or female supervisor
	Create resource and affinity groups within the company
	Ensure all employees are supporting the growth and learning of co-op students
	Be intentional on providing support to students who have had to relocate for co-op and are away from friends/family
Co-op Advisors	Provide FAQ resources for students around co-op experiences
	Provide active data of co-op employers so students can make informed decisions
	Educate students on how to become part of the company’s culture

3.3 Actions Taken Thus Far

Over the past year, our research team has collaborated on the implementation of action items. Our research has been shared with stakeholders at our institution, including the Dean of the College of Engineering, Vice Provost for Academic Affairs, engineering co-op advisors, engineering academic advisors, and the Office of Inclusive Excellence and Community Engagement within the College of Engineering and Applied Sciences. The hope is that by sharing our findings we can create a dialogue and raise awareness around the issues facing women in engineering. At this time we have received a positive response from the college and Dean and hope we can continue this momentum to bring about real change. Specific action items that have been accomplished thus far include: the development of a relocation workshop to support students with information and resources on how to relocate successfully and things to consider through the relocation process, a one page document to be shared with employers on the findings of this study and the importance of relationships, and a one page document to be shared with students on how to more easily navigate developing relationships on co-op and how to incorporate yourself within the company culture. Additionally, we are in the process of creating training for co-op employers

to support them in the creation of more equitable co-op programs. The research team is also conducting additional research to explore options for the creation of a male allies group, to help continue to support this work and the creation of a more equitable and welcoming environment within the College of Engineering for women students.

The goal of sharing the action items and the actions taken thus far is to help readers understand that PAR is doable. Developing action items from the viewpoint of stakeholders who are most impacted by this problem is an effective way to instigate meaningful change. PAR empowers people and provides them the resources they need to solve problems within their own communities.

4. Discussion

We firmly believe that holding space for women and other historically marginalized populations to share their experiences, while also welcoming them into the problem-solving process, has the power to change our community. Systemic change is a long and difficult process, but only by acknowledging the messiness and complexities of the human experience can we move the needle and create lasting change (Coghlan & Brannick, 2010). PAR acknowledges and welcomes the messiness of doing research *with* the community, while explicitly acknowledging power relationships (Littman et al., 2021).

Additional Participatory Action Research and Feminist Research studies need to be conducted to help us better understand the experiences of those not traditionally welcomed to the research table and seek to improve those experiences. We must strive for systemic change that addresses power and privilege in the research space, while also acknowledging the ways in which our research continues to contribute to the marginalization of populations. We suggest that in order to create lasting change in our communities and in our world that we must invite those most impacted to the table to help solve the complex problems facing our world. Acknowledging that change is difficult and implementing action items will be time consuming, but this is the work we are being called to do as researchers working to make a positive change.

There are multiple avenues to incorporate the tenets of PAR into any human-centered research projects. First and foremost, always develop a positionality statement as part of your publications and other forms of dissemination; this recognizes that all forms of research come with researcher bias that needs to be acknowledged. We also encourage you to challenge fellow researchers within your community of practice to reflect on their positionality in their research. Furthermore, incorporating reflective practices as part of your research process promotes reflexivity and equity. This could look like conducting voice-recorded reflections at various points in the research process, memoing written reflections, and could even involve creating artwork. Incorporating a structured ethical reflection, which involves developing an ethical framework with participants, is also an essential aspect of reflection (Brydon-Miller et al., 2015). Ultimately, there are many aspects of PAR that can easily be incorporated into any research project with a bit of time, intentionality, and reflective practice.

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