Executive Summary

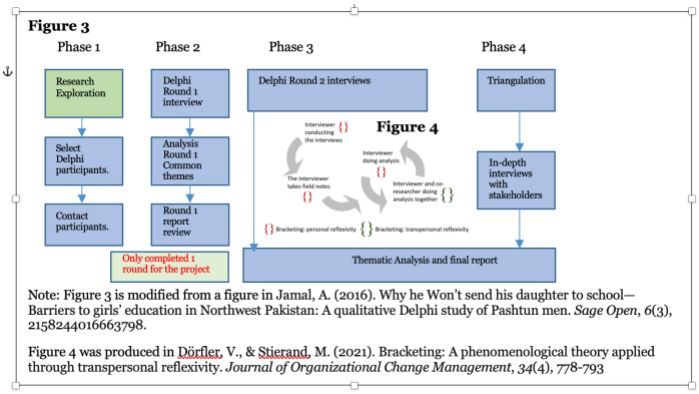
The purpose of this collaboration through a community-engaged scholarship (CES) project was to examine the challenges faced by women in Pakistan who want to pursue education and careers in the fields of science, technology, engineering, and mathematics (STEM), and to propose strategies for addressing these issues in a sustainable and effective way.

The project consisted of three phases, namely (1) community engagement and partnership, (2) data collection and analysis, and (3) intervention development and implementation.

The first phase involved establishing a partnership with the University of Chakwal to identify community needs and challenges. The partnership aims to increase awareness and enrollment of women in STEM fields through the establishment of a STEM Outreach Center at the university. Phase two involved data collection and analysis, using the Delphi method to solicit expert evidence and identify obstacles to women accessing STEM education.

DELPHI METHOD

1) Define the research question and identify the panel of experts.
2) Develop a questionnaire and distribute it to the panel.
3) Summarize the responses and provide feedback to the panel.
4) Repeat steps 2 and 3 until a consensus is reached or a predetermined stopping point is reached.



Note: Figure 3 is modified from a figure in Jamal, A. (2016). Why he Won't send his daughter to school—Barriers to girls' education in Northwest Pakistan: A qualitative Delphi study of Pashtun men. *Sage Open*, *6*(3), 2158244016663798.

Figure 4 was produced in Dörfler, V., & Stierand, M. (2021). Bracketing: A phenomenological theory applied through transpersonal reflexivity. *Journal of Organizational Change Management*, *34*(4), 778-793

Table 1

Participants	Profession	Representative Group
A	Engineer	Female engineer professor /never worked in industry
B	Science Teacher	Unrealized medical doctor
C	PhD Biochemistry	Should be a role model/completed highest level of studies/professor

Represented group of females from within the community. The results which were gathered from the questionnaires through thematic analysis are as follows:

1) Women are made to feel that they are not suitable for STEM. Loss of investment as marriage is ultimate goal.
2) Parents feel that investing in their daughter's education is a loss of investment and money as their daughters will go to the in-laws when they get married.
3) Girls/women need to travel a long distance for education,
4) Access for STEM education or work for women is a stigma for the family, against the honor, against the religion.
5) Men control mobility of women.
6) Unequal sharing/role burden of family responsibilities. Women have to sacrifice their education and career in order to care for the children in-laws, home.
7) Unsafe for women to work around men.
8) Too much societal pressure for parents not to allow their daughters to continue their education.
9) Raise awareness within the society and mentor parents that a STEM educated woman can manage her home and her children better and is ultimately an asset to the country and will improve the economy of the country.
10) The government should provide free transport, training and job security for women.

11) Ensure job equity, protection against harassment, and job protection.
12) Look at other countries, follow their models of success. (Bangladesh has a similar population and had a much lower GDP and its GDP is much higher now).
13) There should be community-based programs to highlight the success of women in STEM.
14) Counseling available to parents to allow their daughters to study.
15) Counseling and tutoring available for the girls to overcome low self-efficacy and mockery, building of a support network for women, coaching.
16) Awareness campaigns to share success stories of women, and build awareness of women studying, build awareness through movies, short documentaries.
17) Online coaching.
18) Positive role models, mentors.

These recommendations are the result of the first round of the Delphi questionnaire. If you look at Figure 3, I propose, as part of the collaboration, we keep the dialogue open and continue to work within the community in focus groups. This initial data has provided substantial justification for the need of a STEM Community Outreach/Engagement Department in the University of Chakwal with a focus on engaging rural women in STEM education. We need to have further dialogue and collaboration to determine the nature, function, and administration of the outreach department.

Phase 3 will focus on intervention development and implementation - The intervention will be designed to address the challenges identified in the second phase. A STEM outreach center will be established at the University of Chakwal, where workshops, training, and mentorship programs will be held to increase awareness and enrollment of women in STEM education. The center will also provide transportation and hostel facilities for women living in far-flung areas. The interventions will be designed to promote STEM education as a viable career option for

women, challenge societal norms, and provide mentorship and role models for aspiring female STEM students. The interventions will be implemented in collaboration with the University of Chakwal and community partners. The community partners will be involved in every step of the process, from identifying the challenges to implementing the interventions. This approach will ensure that the interventions are culturally sensitive and relevant to the needs of the community. The interventions will be evaluated using a mixed-methods approach to measure their effectiveness in increasing awareness and enrollment of women in STEM education.

The fourth phase focuses on the sustainability and scalability of the interventions. The STEM outreach center will be established as a sustainable model, and the interventions will be designed to be scalable to other communities. The interventions will also be designed to be easily replicable, and the community partners will be trained to implement the interventions in their communities. The interventions will also be designed to be cost-effective, using existing resources and facilities.

Conclusion: The partnership between the university and the community was successful in identifying the challenges and needs of the community regarding STEM education for women.

Appendix

Exploring the Obstacles of Women in Pakistan Accessing STEM Education

Delphi Questions Round 1
1. What are the main obstacles that women in Pakistan face when accessing STEM education? 2. How do cultural and societal norms in Pakistan affect women's access to STEM education? 3. What strategies can be implemented to encourage more women to pursue STEM education in Pakistan? 4. How can government policies and initiatives help address the barriers to women's access to STEM education in Pakistan? 5. What role can educational institutions and the private sector play in promoting gender equity in STEM education in Pakistan? 6. Are there any successful initiatives or programs in other countries that could be adapted and implemented in Pakistan to improve women's access to STEM education? 7. What can be done to change the attitudes and beliefs of families and communities towards women pursuing STEM education in Pakistan? 8. What role can mentorship and support networks play in addressing the challenges faced by women in STEM education in Pakistan? 9. How can the media be used to promote gender equity and inspire more women to pursue STEM education in Pakistan? 10. What are the potential long-term benefits of increasing women's participation in STEM fields in Pakistan, and how can these be communicated to stakeholders and decision-makers?