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WEmpower in Saudi Arabia: An Innovative Approach to Empowering Women in Research

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Abstract. **Background:** With the appreciation of the challenges women face in academic research, we developed a concept for an innovative research accelerator program **WEmpower**. **Methods:** We aimed to proactively demonstrate the value of tailored training and mentoring to support and sustain productivity in research. We sought to design and pilot the initiative, review outcomes, and develop recommendations for improvement for further iterations and opportunities to increase the scope and impact of the initiative. **Results:** n=1220 female faculty and post-graduate students from four colleges from all university branches around The Kingdom participated in the 10-day virtual accelerator. N=60 sessions were conducted via a dedicated virtual platform; n=38 interactive webinars, n=18 individual coaching sessions, and n=4 master-classes, with high levels of engagement, positive feedback and impact on faculty morale and drive to work on research. **Conclusions:** There is an imperative to continue to develop the research capabilities of female faculty members, postgraduate students, and researchers, developing their skills and research efficiency, raising their productivity in a practical and flexible way that aims to empower them and advance the research outputs of women in Saudi Arabia and achieve national targets and aspirations of Vision 2030.
Keywords: Women, Research, Empowerment, Science, Technology, Publishing, COVID-19, Saudi Arabia

1. Introduction

Women have made significant contributions to research in many diverse fields, driving innovation, and addressing critical challenges, however many systemic barriers and challenges to their productivity and impact still exist. According to the latest report by the UNESCO, female researchers constitute around 30% of the global scientific workforce, and only 12% of the members of the national academies of science are women, although they are increasingly pioneering work in areas such as healthcare, environmental science, and technology (UNESCO, 2024).

In STEM fields, women are striving to reshape technological frontiers, and progress is being made, but gender disparities persist; only 35% of STEM graduates, and 22% of AI researchers globally are women, and female researchers face unequal career advancement opportunities (UNESCO, 2024). Efforts to close this gap could add $600 billion to global GDP by 2027 through increased participation in tech sectors, underscoring the economic imperative of gender equity in research (UNESCO, 2024).

During the COVID-19 pandemic, women were instrumental in managing public health responses around the world, in many cases leading groundbreaking studies on vaccine development and the utilization of technology, emphasizing solutions with direct societal impact, bridging the gaps between academia and real-world application (UN Women, 2021; Wittenberg-Cox, 2020). However, it is critical to flag that women were simultaneously facing disruptions to work and life resulting from the pandemic circumstances, and the implications of these disruptions are still being felt today (UNESCO, 2024, Watchorn and Heckendorf, 2020).

The global academic community faced significant challenges during the pandemic; anxious and uncertain about future prospects, managing pressures to adopt new digital teaching methods and struggling to balance research productivity with family responsibilities. In the intervening years since the pandemic began in 2020, there have been prolific efforts to assess the impact of COVID-19 on women's academic research productivity (Inguaggiato et al, 2024; Rollins, 2025), and we highlight several key studies here (Rollins, 2025; UNESCO, 2024; Inguaggiato et al, 2024; Sakhiyya et al, 2023; Clark, 2023; Bam et al, 2022; Daub and Crossley, 2022; Davis et al, 2022; Dönmez, 2022; Flaherty, 2022; Jemielniak et al, 2022; Kim et al, 2022; Lesley et al, 2022; Madsen et al, 2022; McDougal et al, 2022; Augustus, 2021; Breuning et al; 2021; Deryugina et al, 2021; Lantsoght et al, 2021; McMillen, 2021; Reese et al, 2021; Ribarovska et al, 2021; Gabster et al, 2020; Minello, 2020; Houser, 2019; Times Higher Education; 2022; Watchorn and Heckendorf, 2020; Squazzoni et al, 2020; Staniscuaski et al, 2020; Viglione, 2020).

The study conducted by The National Academies of Sciences, Engineering and Medicine in 2021 investigated the impact of COVID-19 on the careers of women and found disruptions to workload and schedules, and higher potential exacerbation of mental health conditions such as insomnia, depression, anxiety, and stress than men of similar sociodemographic characteristics (National Academies of Sciences, Engineering and Medicine, 2021).

The circumstances of the pandemic negatively affected productivity, boundary setting and control, networking and community building for women in academic STEM. Collaborations were disrupted, career progression paused, and challenges associated with gendered effects of remote work conflicting with caregiving responsibilities. Women had significantly less time in the day to network and engage in collaborations because of increased non-work tasks (National Academies of Sciences, Engineering and Medicine, 2021).

The study also identified that women's shares of first authorships, last authorships, and general representation per author group as well as overall team size decreased during the COVID-19 pandemic. Women published fewer papers and received fewer citations of their work between March 2020 and December 2020, which was expected to have a knock-on effect on career progression, job stability and future potential to obtain funding. The pandemic circumstances led to increased burnout, sleep disturbance, and poor appetite; increased interpersonal problems; and decreased motivation (National Academies of Sciences, Engineering and Medicine, 2021). This was similar to the findings of Squazzoni et al (2021) who assessed data on over 5 million submitted manuscripts and peer review activity

for all Elsevier journals between 2018-2020 and identified that women were submitting proportionally fewer manuscripts than men, a deficit especially visible among younger female academics (Squazzoni et al, 2021).

A survey conducted by De Gruyter's on 3000+ academics in 100 over countries found the Coronavirus pandemic and lockdown had left academics with less time for research and busier than ever, with women most severely affected (Watchorn and Heckendorf, 2020). 70% reported that online and virtual teaching left them less time for research, with social science scholars being particularly time poor, as organising online lessons and supervising students virtually poses obstacles to writing and publishing productivity (Watchorn and Heckendorf, 2020).

The "motherhood penalty", "leaky pipeline" and "impostor syndrome" phenomena have been found to exacerbate disparities, with childcare responsibilities disproportionately affecting women's research career progression and output (Vaughn et al, 2019; Times Higher Education, 2022; Squazzoni et al, 2021; Watchorn and Heckendorf, 2020; Staniscuaski et al, 2020; Viglione, 2020; UNESCO, 2024). The study by De Gruyter's found 50% of respondents had 'no time at all' or 'less time' for research and writing than they had before lockdown with female scholars reporting greater time pressures than male colleagues (simultaneously having to manage childcare responsibilities and their distance schooling requirements) (Watchorn and Heckendorf, 2020).

Most recently, the US Institute for Women's Policy Research (IWPR) has released two new reports on the effects of the post-pandemic period on women's employment, job distribution, and care responsibilities that show despite some improvements in employment rates for women, disparities persist, which indicate that further structural policy reforms, and care economy investments, are necessary to ensure women's long-term workforce engagement (Rollins, 2025; UNESCO 2024).

As part of the ambitious strategic framework of Vision 2030 in the Kingdom of Saudi Arabia, the Human Capability Development Program was launched in 2021 to equip citizens with future-ready skills through education reform and investment into research and innovation (HCDP, 2025, RDIA, 2025; GASTAT, 2025). The Research, Development, and Innovation Authority (RDIA) was also established in 2021 to coordinate the national budget for the advancement of national priorities in research and development such as renewable energy and biotechnology (RDIA, 2025).

Women's empowerment in Saudi Arabia has been central to the achievement of Vision 2030 and the research and development targets, with female researchers now constituting around 40% of the national R&D workforce, an increase of 15% since 2015 (RDIA, 2024, GASTAT, 2025). RDIA is working on a National Saudi Research Strategy and is implementing a program to encourage the achievement of a national target for 1000 Women in STEM (RDIA, 2025). Women currently represent 58% of STEM graduates in the Kingdom and hold 35% of leadership roles in research institutions, supported by research grants from RDIA, which has pledged to allocate 30% of innovation funding to female-led projects, and universities across the Kingdom (Saudi Vision 2030 Annual Progress Report, 2024; RDIA, 2024). These efforts reflect the Kingdom's commitment to developing and sustaining the research and innovation sector and aligning with the Vision 2030 target of increasing women's workforce participation and engagement to 35%, which has already been surpassed at 37% as of Q1 of 2025 (GASTAT, 2025).

Out of 675 researchers listed from Saudi Arabia in 2024, and with the acknowledgement of women of other nationalities affiliated with universities in the Kingdom, we were able to identify only 8 Saudi

women, and none in the top 50 in the country (Ioannidis, 2024). In reviewing these prominent international research rankings, we found several Saudi women researchers had been listed in the years between 2020 and 2025, noting that several had intense periods of productivity, which then dropped off (Ioannidis, 2024). It is imperative to promote consistent efforts to enhance women's competitive research participation and boost the quality and value of the outcomes, sustain productivity, and work to identify and proactively mitigate challenges, developing innovative ways for women to work and engage in research activity, collaborating within and across disciplines.

With the understanding and appreciation of the issues outlined here, the WEmpower Women's Research Accelerator initiative was developed in 2021 and aimed to proactively target these emerging trends and mitigate the challenges facing female early and mid-career researchers in academia using an innovative approach, demonstrating the value of tailored training, mentoring and support.

The theoretical underpinnings of WEmpower can be understood through established innovation frameworks. Rogers' Diffusion of Innovation Theory provides insight into how new practices in academic mentoring, digital learning, and research networking can be gradually adopted among female researchers, thereby accelerating knowledge uptake and behavior change (Rogers, 2003). Similarly, the Open Innovation Framework emphasizes the importance of cross-institutional collaboration and knowledge sharing, which are central features of the WEmpower initiative (Chesbrough, 2006). Furthermore, the program aligns with the Triple Helix Model of innovation, which highlights the dynamic interaction between universities, government, and industry in driving a knowledge-based economy (Etzkowitz & Leydesdorff, 2000). Positioning WEmpower within these frameworks illustrates its innovative contribution to women's research empowerment and its relevance to the national Vision 2030 agenda.

The WEmpower initiative aimed to identify challenges facing women in academia and design a model for a research accelerator to support and sustain productivity in research. We sought to pilot the initiative, review outcomes, and develop recommendations for improvement for further iterations and opportunities to increase in scope and impact. We describe our efforts to design and implement this initiative in this paper.

2. Materials and Methods

Study Design

Cross-sectional descriptive intervention study using a pre and post survey, designing and implementing the accelerator program and assessing for value and impact.

Setting and Sample

The Saudi Electronic University is a national public university, headquartered in the capital city of Riyadh, with 14 branches across the Kingdom of Saudi Arabia. The University operates using a hybrid-learning model, with over 1000 faculty members and 49,000 students, male and female, of various nationalities (Saudi and non-Saudi) in both undergraduate and postgraduate programs in four colleges. The Saudi Electronic University is the national licensed provider for Blackboard LMS® and is well placed to offer various hybrid and virtual learning opportunities, utilizing its immense digital learning capabilities and national coverage. The WEmpower program initiative targeted all female academic faculty and postgraduate students at the Saudi Electronic University in 2021.

Measures

A full literature review was conducted to identify common challenges facing women in academia, inform the design of the survey instruments and the program, benchmarking other similar initiatives and outcomes.

Survey Instruments Development

The pre-survey was designed to assess for basic demographic information, age, academic rank, length of service or study, research interests, productivity, output, challenges and needs to support in research conduct, offering the opportunity for respondents to share their views with several open-ended questions. The post-survey was designed to assess and compare the basic demographic information, age, academic rank, length of service or study, views on the accelerator program and impact on their skillsets and productivity, as well as open-ended questions to allow for free-text insights and program feedback and comments. All forms were developed using Google Forms. Survey instruments were submitted to the University Institutional Review Board, and ethical approval granted accordingly (SEUREC-CHS20105).

Data Collection and Analysis

The pre and post surveys were sent out via institutional e-mail to all female faculty members. Contact lists were requested through the appropriate official university channels, and official e-mail invitations to participate in the surveys and program were sent, and responses collected for analysis. The program initiative was proposed in February 2021, and the pre-survey sent out in March 2021. Data was analyzed and used to inform the design of the intervention in the form of the research accelerator program by the program team in April 2021, and were presented to the University administration for approval, along with the program design and implementation plan.

The program was implemented in August 2021, using a digital learning management system Blackboard LMS, and the post-survey sent out in September 2021. Descriptive and inferential statistics were used to assess post-survey data, and thematic analysis was used for open-ended survey questions and program feedback items. The post-survey findings were presented to university administration for review as part of the final program report.

3. Results

Participant Characteristics

For the pre-survey, we received n=138 responses of n=277 total SEU female faculty (49.8%), n=9 Associate Professor rank, n=50 Assistant Professors, and n=29 Lecturers and n=50 students from n=657 (7.6%) female postgraduates from across all four academic colleges at the University; n=18 from the College of Computing and Informatics, n=49 from the College of Health Sciences, n=45 from the College of Finance and Administration, and n=20 from the College of Science and Theoretical Studies.

For the post-survey we received n=54 responses from program participants, of which n=6 Associate Professors, n= 26 Assistant Professors, n=9 Lecturers and n=13 post-graduate students from across all four academic colleges at the University; n=18 from the College of Finance and Administration,

n=16 from the College of Health Sciences, n=9 from the College of Science and Theoretical Studies, and n=٨ from the College of Computing and Informatics.

Research Needs and Challenges Identified

Our pre-survey findings identified that n=83 (60%) felt that their research productivity had been negatively affected by the pandemic. Among the reported reasons limiting research productivity were administrative workload n=32 (23.1%), teaching load n=41 (29.7%), lack of skills or expertise n=37 (26.8%), lack of access or support n=35 (25.3%), erratic schedules n=22 (15.9%), remote working n=26 (18.8%), difficulty concentrating n=38 (27.5%), challenge to prioritize research work n=34 (24.6%), lack of time for writing n=58 (42%), health issues n=16 (11.5%), childbearing or breastfeeding n=15 (10.8%), childcare and family responsibilities n=48 (34.7%) (Figure 1).

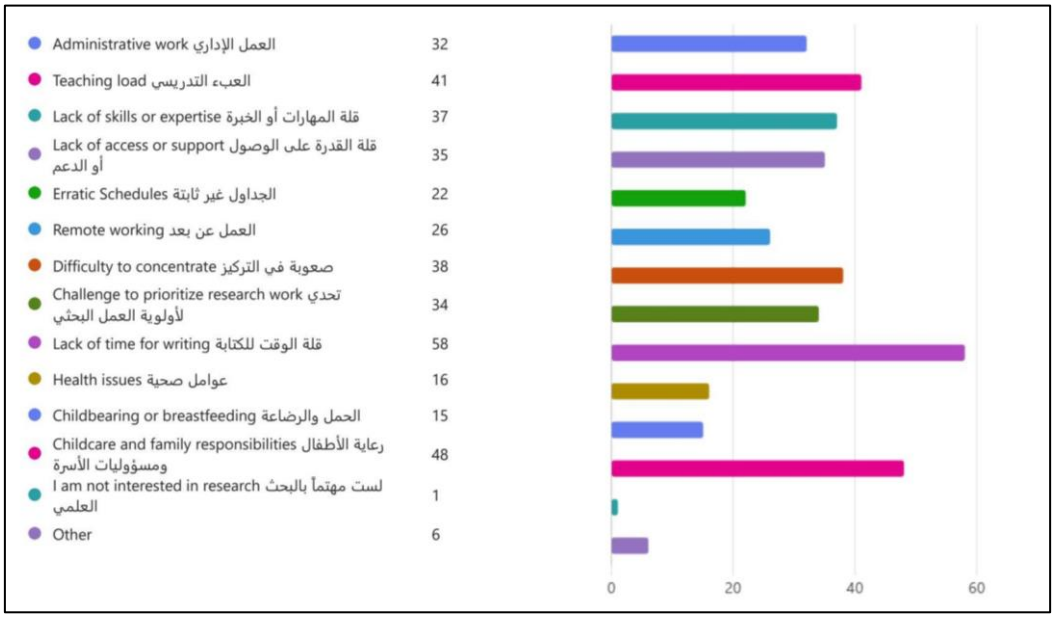

Figure 1. Reasons Limiting Research Productivity

We found n=73 (52.8%) of respondents preferred research training in the English language. We found that n=82 (59.4%) were interested in training in quantitative research skills, and n=76 (55%) were interested in training in qualitative research methods. n=82 (59.4%) were interested to learn how to use research software programs, and n=75 (54.3%) were interested to develop their skills in academic and scientific writing and literature review conduct. n=54 (39.1%) were interested in training in referencing and citation skills. n=76 (55%) were interested to learn more about journal selection and publication processes, and n=36 (26%) were interested in learning how to navigate research ethics and approval protocols. n=63 (45.6%) were interested in learning how to identify and apply for funding and complete successful grant proposals, and n=72 (52.1%) were interested to learn about the requirements for academic promotion. n=49 (35.5%) were keen to learn more about how to work successfully in research teams and communicate effectively (Figure 2).

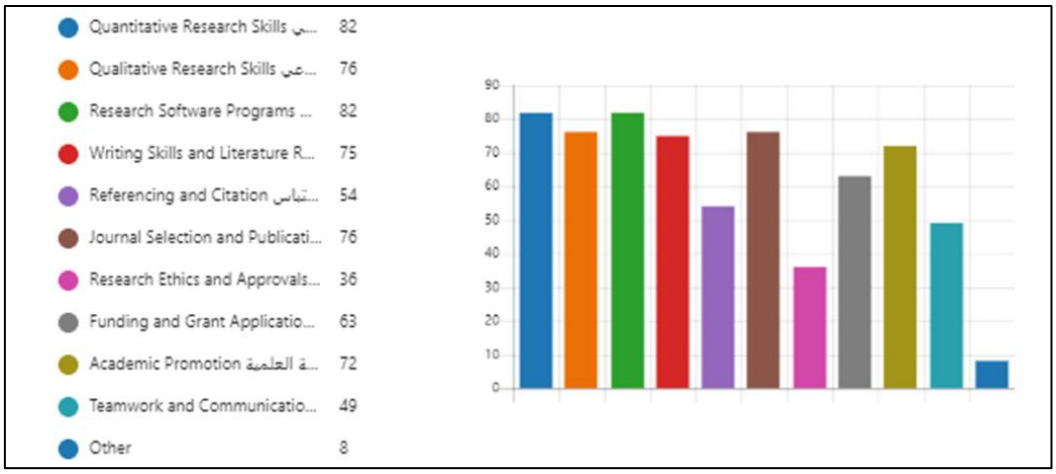

Figure 2. Training Topics of Interest for Faculty and Postgraduates

As for the findings on research software training, we found n=39 (28.2%) were keen to learn how to use R Studio, and n=91 (65.9%) indicated interest in building the skills in using SPSS. n=44 (31.8%) were interested to learn how use STATA more efficiently, and n=39 (28.2%) were interested to learn how to use MATLAB. n=31 (22.4%) were interested to learn how to use RefWorks, and n=51 (36.9%) were interested to learn how to use Microsoft Office Suite Programs to facilitate their research projects and writing. N=28 (20.2%) were interested to learn how to use Latex, and n=27 (19.5%) were interested to learn how to use NVIVO for qualitative analysis and thematic coding (Figure 3).

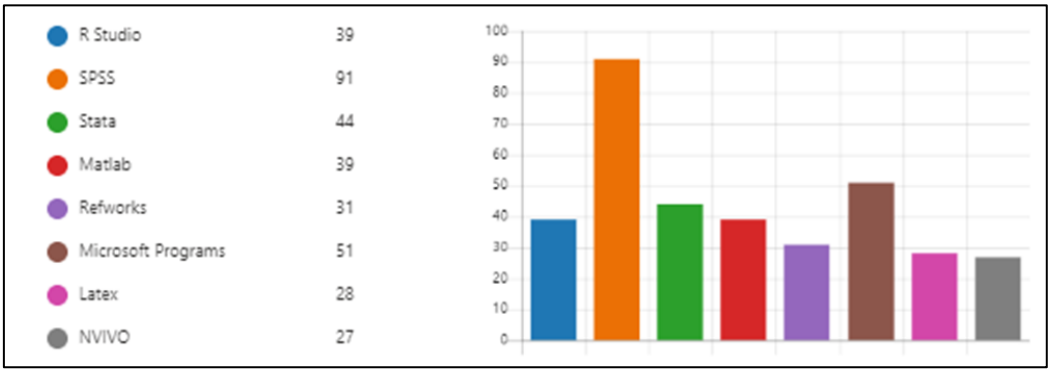

Figure 3. Research Software Programs of Interest for Faculty and Postgraduates

Survey responses indicated an overwhelming majority interest in having a personal research mentor to support their development and progression in academia; n=97 (70.2%), and n=91 (65.9%) reported interest in blocking off moderated free time for research and writing. n=93 (67.3%) respondents indicated interest in networking and identifying opportunities for research collaboration. We also received valuable input and suggestions with names of research experts that respondents were keen to engage with and learn from, from within the university and nationally.

Program Design Components

The accelerator program was designed to span 10-days of intensive sessions including live virtual seminars and discussion sessions on key topics including the role of women in scientific research, research ethics, academic promotion and grants funding requirements, research team dynamics and responsibilities, innovation in research, research methodology and methods, academic research writing and critical analysis, efficient use of digital scientific databases and software applications for research conduct and data analysis, and journal selection and submission techniques.

The program also incorporated several masterclasses in academic writing skills, referencing and citation, meta-analysis, and survey design. The recorded seminars and masterclasses were recorded and saved to the digital platform and number of views and downloads monitored (see Table 1).

Table 1. WEmpower Program Components

Type of Session	**N**
Interactive Webinars	38
Individual Coaching Sessions	18
Masterclasses	4
Total	**60**

The program also provided opportunities for individual sessions with research productivity and innovation coaches, experts in academic promotions, as well as experts in academic writing, citation and referencing, experts in quantitative and qualitative research methodology and methods, experts in a variety of data analysis and software applications for research, and several free writing sessions to allow for focus and achievement, and a networking session where participants could develop personal and professional connections and establish collaborations for particular research endeavors.

The expert speakers n=26 were selected from fifteen prominent research centers and universities from around the Kingdom as well as experienced faculty from the Saudi Electronic University, according to the program topics identified from the pre-survey as areas of interest for the participants, and considering specific criteria for level of expertise and area of experience in research and other skills, as well as documented evidence of their research achievement, proven teaching and speaking abilities, and the willingness to engage with participants and share their professional and personal experiences in learning to navigate the challenges of research as women in the field. We were keen to showcase the immense capabilities of women researchers in Saudi Arabia and provide a platform where they could share their expertise with younger researchers, a Saudi initiative, by women, for women.

While initially targeting female faculty members, a decision was made to include all female postgraduate students in the offer to enroll and participate in the program, to promote the development of their research capabilities, encourage publication of their postgraduate work, and assess for their feedback as beneficial to the future development of the program and university research initiatives in general.

The program was intentionally scheduled to run during the run-up to the new academic year, before the start of the semester, to allow faculty and post-graduate students to attend the sessions and fully engage with the content and expert speakers, with minimal distractions and conflicting demands on

their time. The sessions were designed to facilitate selection and engagement of all skill levels for participants: beginners, intermediate and advanced, running from 9:00am to 6:00pm daily with intermittent breaks, with a requirement to attend at least 75% of the program to achieve a certificate of completion.

Logistics and Operations

The WEmpower organizing committee coordinated sessions, schedules, speaker selection, and communication with participants via Blackboard LMS. Logistical support included webpage development, session recording, and engagement through social media**.**

The program organizing committee held more than 10 meetings over a period of six months to plan and prepare for the program. This included identifying the sessions and their types, allocating the daily schedule and number of days, selecting the platform to be used, estimating the required budget, nominating and screening speakers, approving their selection to share their expertise, managing communications, following up on the design of digital content, including the program page on the university's website, publications such as schedules, announcements, certificates, forms, and questionnaires, preparing the platform, managing the sessions, and following up on public relations and media for the program on social media networks such as Twitter, LinkedIn, and local newspapers and news. A dedicated webpage for the program was created on the university's website. The webpage included an overview of the program, session titles and topics, names of expert speakers, details on their backgrounds and research experiences, and information on how to register and contact the program committee https://seu.edu.sa/en/events/wempower.

A detailed schedule was arranged during the weeks and days preceding and during the program and tasks were distributed to committee members for supervision and session facilitation. The Deanship of Human Resources provided lists of female faculty members, and the Deanship of Graduate Studies provided lists of female postgraduate students. These lists were submitted to the Blackboard Administration to be added to the program space. The program did not require self-registration; participants were automatically added to the space in their university accounts after being added. Participants were able to log in and participate easily. The program launch date was announced in advance, along with a schedule and detailed participation instruction guides and procedures for the target group via email, social media messages, and Blackboard. The links for the daily sessions were created in the dedicated Blackboard Space according to the program schedule, and all sessions were recorded to facilitate participants ability to return and rewatch/relisten to the material and continue to engage even after the official 10-day accelerator program. Daily messages were sent to encourage participant engagement and promote the sessions. The accelerator concluded with a message sent to the participants informing them that the session content and recordings were saved on Blackboard, where they could access, listen to, and benefit from them for two months after the accelerator's conclusion.

Program Participation and Feedback, Impact on Research Output

Even before the accelerator program was launched, the supervisory committee was inundated with inquiries from various parties, expressing interest in registering. During the first days of the program, many participants sent emails and social media messages expressing how much they enjoyed certain sessions, how much they benefited from their time with a particular expert, how many times they went back to listen to the recordings and take more detailed notes and apply them, how much they liked the program content and the scheduling of the sessions, or how motivated they felt connecting

with other women facing similar challenges. We had many participants who attended every accelerator session without exception. We had over n=1,220 participants over the 10 days of the accelerator, and we continue to receive high praise for the motivating effect the accelerator had on them, boosting their confidence and ability to conduct high-quality research, and supporting them in achieving their professional and personal goals. Many comments from speakers and feedback participants were received as part of the post-survey and saved as snapshots of conversations and social media messages expressing their interaction with the program.

Participants reported high rates of engagement with the Accelerator sessions, as n=31 (57%) attended the Academic Writing Skills Masterclass, and n=24 attended the Referencing and Citation Masterclass (44%), n=22 (40%) attended the Survey Design Masterclass, and n=19 (35%) attended the Meta-analysis Masterclass, and attendance at the interactive webinars averaged n= (Figure 4).

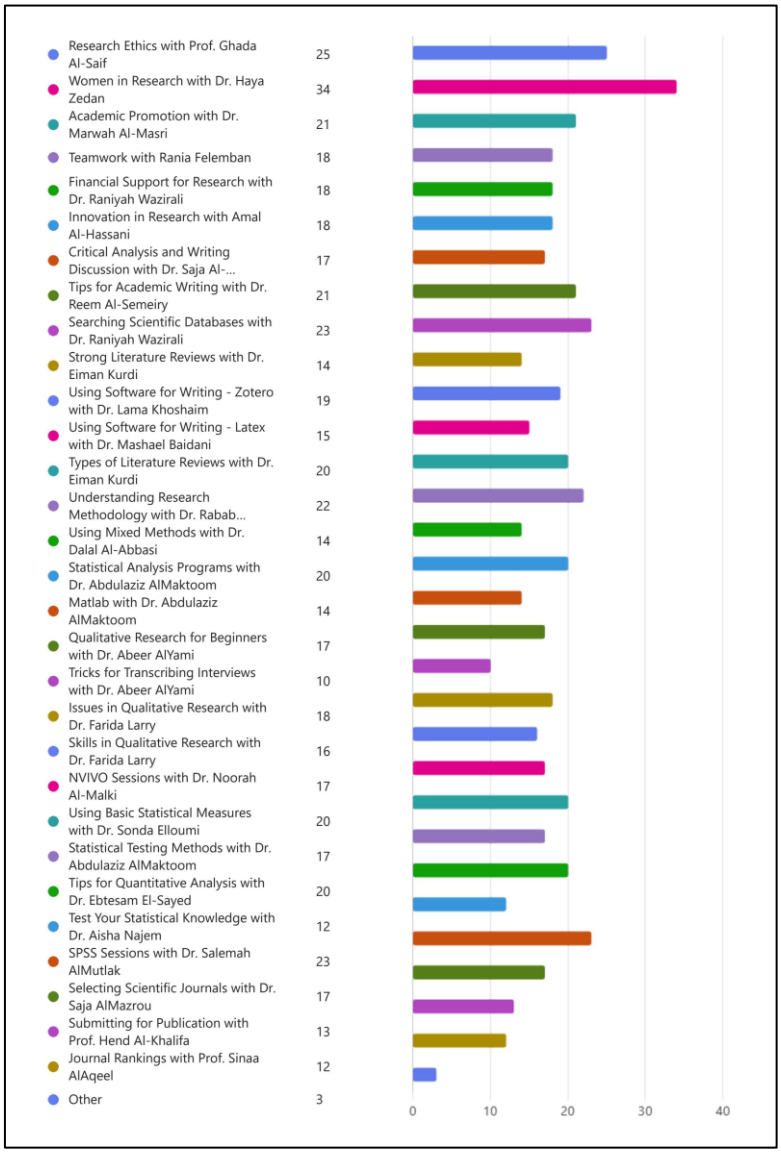

Figure 4. Interactive Webinar Attendance

Statistics showed n=42 (77%) attended the free writing sessions, and n=38 (70.3.%) attended the individual coaching and mentoring sessions and the dedicated networking session. N=51 (94.4%) felt they benefited from the WEmpower Program and provided valuable free text feedback (Table 2).

Table 2. WEmpower Program Feedback

Feedback Comments
"The program was very interesting and covered many topics related to scientific research. It included professors specialized in all topics. It's a wonderful initiative and its topics were very useful. I will definitely return to watch the recordings of the classes I was unable to attend".
"Well-organized with brilliant speakers MashaAllah. It was the best of its kind very informative and useful."
"I wish it was term-time and face-to-face. I wish it could last or at least to find these exceptional professors in a page or reach them somewhere."
"Thanks for all the effort. Suggest to organize more such workshops, seminars and conferences."
"It's a great initiative to help women's research trajectory, whether she is a novice or advanced researcher."
"The content is beautiful, enriching and useful, so please be mindful of the timing."
"Thank you. These were useful, beautiful, and enjoyable days."
• البرنامج ممتاز ومشجع ومحفز وايضا يفضل لو قدم باللغة العربية لزيادة الفائدة • برنامج مفيد جدا للباحثين. جزاكم الله خيرا. برنامج أكثر من راااائع
"Nice initiative. The program was well organized and well-articulated towards our needs."
"Very beneficial and value-intense, very rich in content, knowledge and experience of the speakers, potential to learn and explore."
"It was a great experience for us. Keep organizing such type of programs next year also. Best wishes for future."
"This is inspired group, thank you for your great effort."

4. Discussion

The WEmpower program initiative sought to support scientific research activities by female academics and postgraduate students, using the multiple educational and technological components at the Saudi Electronic University. The WEmpower program hoped to create a space for female academic faculty and postgraduate students to develop their research ideas and skills, network, share their research challenges and develop innovative solutions. The program was designed to increase the productivity of valuable scientific research by female academic faculty and postgraduate students, enhance research cooperation and collaboration opportunities between female academic faculty and

postgraduate students and create women's research groups, and facilitate participation in scientific research activity and utilization of the digital platforms at the University.

Our review of recent literature consistently highlights that women's scientific productivity and research outputs have been significantly hampered by the COVID-19 pandemic and its aftermath (Davis et al., 2022; Flaherty, 2022). The pandemic disruption to academic routines, combined with increased caregiving and family responsibilities and limited access to research infrastructure, exacerbated existing gender disparities in research engagement and dissemination (Kim et al., 2022; Lesley et al., 2022).

During the pandemic, women were disproportionately affected, facing a 'double burden', having to balance professional responsibilities with heightened family and caregiving duties (Viglione, 2020). This situation contributed to workload and schedule disruptions, coupled with mental health stressors, leading to increased burnout, decreased motivation, reduced research output, fewer publications, and diminished participation in scholarly activities (Squazzoni et al., 2021; National Academies of Sciences, Engineering, and Medicine, 2021); which was clearly reflected in our findings as well. Additionally, women's ability to engage in networking, collaboration, and career development activities was constrained, further impairing their academic contributions.

These disparities are not solely pandemic-specific but are rooted in broader systemic issues that constrain women's participation in science and technology fields (Inguaggiato et al, 2024). For example, the "motherhood penalty" and the "leaky pipeline" and "impostor syndrome" phenomena have historically limited women's academic progression, with the pandemic amplifying these effects (Vaughn et al, 2019; Madsen et al., 2022). Women in STEM often face unequal opportunity structures, with fewer mentoring and funding opportunities compared to their male counterparts (Inguaggiato et al., 2024).

Our findings corroborate these global trends, indicating significant disparities in research productivity and revealing that women face considerable challenges in maintaining strong output; influenced by high pressures of academia, intense demands on their time, expectations around their abilities and responsibilities, increasing participation in the workforce and in leadership positions — issues that have long-term implications for their career advancement and influence within academia.

Our findings from the post-survey found high levels of engagement, positive impact on faculty morale and impetus to work on research, which we found deeply gratifying, and we are exploring further data analysis for long-term impact assessment on research output and academic promotions in collaboration with the university.

From a theoretical perspective, the WEmpower model aligns with innovation frameworks in higher education, particularly those emphasizing capacity-building, mentoring, and digital learning as enablers of academic productivity. This innovative approach illustrates how structured interventions can address systemic barriers facing women in academia, contributing to broader knowledge economy development.

Strengths and Limitations

This project had several strengths that must be highlighted. As it was a grassroots initiative, it was able to identify an area of need for female academics and zero in on pain points, and developing a

program framework that was flexible and adaptable, understanding the needs of women navigating the challenges of the pandemic and balancing their other conflicting responsibilities. The program benefited from the strong support of the university leadership and administration and was able to effectively utilize the unique digital capabilities of the university system to implement the program.

The program committee faced several limitations and challenges, as there was some difficulty managing the consecutive sessions over the course of the accelerator program due to the small number of committee members and the lengthy morning and evening sessions. Despite the suitability of the Blackboard platform and the program's success, the committee found limited ability to track the number of views of the recorded sessions via the Blackboard platform (subsequent views by participants). This feature was not available on Blackboard (at the time), despite a large number of participants communicating and reporting their benefiting from the recordings. A number of participants were unsure how to access and navigate the Blackboard space designated for the program, despite the explanation of the login process via email, direct links, instructional guides, and an introductory video containing a live demonstration of how to access and attend the sessions.

There was some difficulty in assigning participants in booking the individual coaching session timeslots. To address this challenge, we used Calendly®, a platform that helps schedule separate time slots according to a specific schedule. Some technical difficulties were encountered, such as the deletion of some anticipated appointments. The committee sought to increase communication opportunities among participants by holding a professional networking session to discuss forming research teams. However, the need to maintain the privacy of participants' contact information limited the ability to create a suitable communication environment. Researchers' information was provided upon request after verifying the consent of all parties. These factors must be taken into consideration in further iterations of the program.

One limitation of the present study is that it primarily captures short-term outcomes through the pre- and post-program surveys. Longitudinal indicators of women’s research impact such as publication output, successful grant applications, and academic promotions, were not measured in this initial evaluation, although further analysis is ongoing.

Recommendations

The initiatives such as the WEmpower program exemplify proactive strategies to mitigate these disparities by offering targeted training, mentorship, and networking opportunities to women in academia. Our program’s encouraging results—highlight the potential of such tailored interventions. Nonetheless, systemic change requires sustained efforts beyond individual initiatives and programs. Policymakers and academic institutions should prioritize structural reforms, including reducing teaching loads for active women researchers, providing dedicated research funding, and promoting work-life balance policies (Rollins, 2025; UNESCO, 2024).

Moreover, digital platforms and virtual mentorship programs represent promising avenues to enhance access to resources and expertise, especially in contexts where women face societal or cultural barriers (De Gruyter, 2020). The integration of such innovations can foster a supportive environment conducive to gender equity in research participation.

The outcomes of WEmpower hold significant policy relevance, particularly for national initiatives under Saudi Vision 2030 and the Research, Development and Innovation Authority (RDIA). Embedding such models into institutional strategies can strengthen women's participation in research, align with the Human Capability Development Program, and contribute to achieving Sustainable Development Goal (SDG) 5 on gender equality.

We recommend expanding on the WEmpower initiative, incorporating longitudinal assessments of its long-term impact, and embedding more gender-sensitive policies within national academic and research frameworks, consistent with Sustainable Development Goal (SDG) 5—gender equality (United Nations, 2015). From this, we provide several practical recommendations, key among them:

1. Building Research Culture Early and Broadening Reach

- Promote perseverance in fostering a culture of scientific research among female university faculty and postgraduate students.
- Update and relaunch the WEmpower program and expand the target group to include other universities and research entities nationally and include women in secondary education.
- Consider further linkage between program output and sponsorship opportunities for national and international postgraduate and post-doctoral research programs.

2. Enhancing Research Skills and Capabilities

- Train female students in scientific research skills and collaborate with general education to establish research and scientific publishing skills from a younger age.
- Increase female faculty research competence through training and support in innovative, multidisciplinary, and high-level scientific research using investigative and advanced methods, contributing to a sustainable knowledge economy and strengthening Saudi research output.
- Facilitate participation in seminars and conferences and nominate women for representation in research forums.
- Form women's research groups and determine national or institutional research priorities.

3. Institutional Support and Incentives

- Assess potential for reducing teaching hours for accomplished and active female researchers as an incentive to sustain their research productivity.
- Activate digital platforms to promote scientific research culture at the university, including periodic email newsletters highlighting the university's research achievements, encouraging messages about scientific research, maintaining an interactive space with discussion boards on research topics, conferences, and events.
- Introduce annual awards, including one for distinguished researchers and a dedicated award for an outstanding female researcher.
- Activate university research groups, including dedicated women's research groups, facilitate monthly virtual meetings for researchers to share experiences, discuss published work, and foster collaboration.

4. Monitoring, Evaluation, and Policy Input

- Conduct further studies on issues affecting women's research productivity and academic engagement and develop comprehensive recommendations to mitigate their effects.

- Provide the Ministry of Education and RDIA with detailed information on program outcomes, including survey data and policy recommendations.

Future iterations of WEmpower should incorporate longitudinal follow-up to assess sustained outcomes, including research productivity, scholarly publications, and career advancement milestones. Such data will provide opportunities for more rigorous evaluation of the program's long-term impact on women's empowerment in research.

Conclusions

The WEmpower initiative demonstrates a scalable and innovative model with the potential to inform both academic practice and national policy, making it a valuable contribution to ongoing conversations on women's empowerment in research.

With the appreciation of the University's and Saudi government support for women in research, we see the importance of continued development of the research capabilities of female faculty members, postgraduate students, and researchers, developing their skills and research efficiency, raising their productivity in a practical and flexible way that aims to empower them and advance the research outputs of women in Saudi Arabia.

The WEmpower program is an innovative model that can be adopted by other universities and scaled by the National Research and Development Authority (RDIA) to enhance the quality of research training and skills development for women and facilitate the building of a robust knowledge economy in the Kingdom of Saudi Arabia. Looking ahead, empowering women in research requires investment and systemic reforms. Scaling such projects and prioritizing increased funding for training for women in STEM are critical steps. As we work towards the achievement of the Saudi Vision 2030 and the 2030 Sustainable Development Goals, amplifying women's voices in research design, productivity and leadership will unlock this untapped potential, ensuring scientific progress that benefits our society and economy.

6. Patents

Not applicable

Author Contributions: HZ developed the original initiative concept and program proposal, conducted the literature review, developed the survey instruments and program outline. HZ, RW and LK collaborated on the development of the survey instruments, data collection and analysis, program development, implementation, and supervision of program sessions. HZ oversaw the formal program committee and drafted the required reports and manuscript draft. All collaborators reviewed program documents, reports and manuscript draft before submission for publication.

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Appendix

Not Applicable

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