Report from Women in Engineering Panel at IEEE ICALT 2021

Rita Kuo, *Member, IEEE*, Michelle Banawan, Jaelyn Domingo, Elvira Popescu, *Senior Member, IEEE*, and Ramyaa Ramyaa

I. Introduction

Females are minorities in STEM fields [1][2]. According to the data of the Bureau of Labor Statistics in the United States in 2020, 46.8% of employees are females. However, in the computer and mathematical occupations, only 25.2% of the employees are females [4]. To help the IEEE Technical Committee on Learning Technology (TCLT) community understand the crisis of low employment in female engineers, the Women in Engineering Panel is hosted annually at the International Conference of Advanced Learning Technologies (ICALT) starting from 2017.

The Women in Engineering Panel in ICALT usually invites at least two women scholars, at least one student, and one professor/engineer/researcher working in STEM areas at her early career stage. The panelists discuss various issues such as:

- Which challenges have you encountered (if any) for women in engineering at any level?
- What are potential solutions – perhaps from your experience, or at a systemic level – to address these challenges and encourage more women in engineering?
- What should the women in leadership positions project?

At the end of the panel, the TCLT chair responds on how the technical committee could address some of the issues, concerns, comments, and recommendations for promoting Women in Engineering raised by the panelists and ICALT participants.

II. Women in Engineering Panel at ICALT 2021

IEEE ICALT was held online in 2021 from July 12 to July 15. The Women in Engineering Panel was presented on July 13 at 4pm (GMT). The panelists include:

- Dr. Michelle Banawan from Arizona State University, USA. She is a postdoctoral researcher in the Science of Learning and Educational Technology (SoLET) laboratory of Dr. Danielle McNamara. She was formerly an assistant professor in the Computer Science Department in Ateneo de Davao University in the Philippines.
- Jaelyn Domingo, an undergraduate student in the Department of Computer Science & Software Engineering at California Polytechnic State University. She was also the outreach director in the Women Involved in Software and Hardware (WISH) club in 2020-2021 term.
- Dr. Elvira Popescu from University of Craiova, Romania. She is also the Vice Chair of IEEE Women in Engineering Romania Section Affinity Group.
- Dr. Ramyaa from New Mexico Institute of Mining and Technology in the USA. She is also a member of the Women in Computer Science (WiCS) program in the Department of Computer Science & Engineering.

Dr. Popescu first introduced the mission of IEEE Women in Engineering, which includes aiding with the formation of new IEEE WIE Affinity Groups and supporting ongoing activities, organizing workshops at major technical conferences to enhance networking and to promote membership in IEEE WIE, facilitating the development of programs and activities that promote the entry into, and retention of, women in engineering programs [5]. The Romania Section Affinity Group has conducted multiple activities, such as student meetings, technical presentations, and round tables in-person in the past few years and has moved the activities online in the last year due to the pandemic.

Her presentation also addressed the impact of COVID-19 on the careers of women in academia. Because of the pandemic, almost all educational institutions worldwide imposed some restrictions on face-to-face activities, including teaching and research. This translated into higher work demands for shifting to online instruction and substituting laboratory-based research. This was coupled with an increase in the caregiving and domestic tasks (and especially childcare due to school closures), whose burden was predominantly carried by women. According to the report in [3], the most commonly mentioned effects of the pandemic on the professional work of women faculty included: increased workload due to more meetings, longer hours, more emails; decreased productivity and efficiency, with difficulties in finding focus and being always behind schedule; challenges in interacting with peers and students and in adapting to remote teaching, as well as overall negative effects on research. Furthermore, among women faculty with children, over 71% reported increased childcare demands, also more behavioral and academic needs dues to homeschooling, coupled with a lack of childcare accessibility and affordability [3]. Some coping strategies and boundary management tactics were also discussed.

Dr. Popescu ended her presentation with a few open questions that the participants can discuss with their colleagues regarding how to help females in academia to face the crisis during the pandemic. The questions include what changes implemented at institutional level can support participation and advancement of women in STEM and how does the switch to online events impact collaboration and mentoring relationships.

Dr. Ramyaa has a different experience with regards to gender discrimination. She faced no discrimination when she was in the

Received September 25, 2021, Accepted September 26, 2021, Publish online October 11, 2021.

R. Kuo is with New Mexico Institute of Mining and Technology, Socorro, MN 87801 USA (e-mail: rita.mcsl@gmail.com).

M. Banawan is with the Arizona State University, Tempe, AZ 85281 USA (e-mail: mbanawan@asu.edu).

J. Domingo is with the California Polytechnic State University, San Luis Obispo, CA 93407 USA (e-mail: jdomin31@calpoly.edu).

E. Popescu is with University of Craiova, Craiova, Romania (email: elvira.popescu@edu.ucv.ro).

R. Ramyaa is with New Mexico Institute of Mining and Technology, Socorro, MN 87801 USA (e-mail: ramyaa.ramyaa@nmt.edu).

single-gender school in her early ages and the sex-segregated undergraduate school in India. However, when she went to the United States for graduate programs, she was usually the only girl in the department or in the class. Most people believe science and math are the areas for men, not women. Because of the discrimination, she only asked questions in the class only after establishing her credentials as a strong student; she was afraid that a naive or basic question will make others believe that she is stupid. She felt that she was the only person representing the minority group among the majority group, so any contribution she made – positive or negative – reflected on the entirety of the community.

When she became a teacher, females were also minorities in her class. Female students – especially international female students – prefer to team with other female students and this makes their team to be the only minority group. If she put the female students in the same team, does it mean that she prefers the minorities should be in the same team? If she rejects students' requests, does it mean that she does not allow students to stay with the people in their comfort level? A similar dilemma happened when hiring research assistants from the current students. If she hired minorities, will the majorities believe she picked them up because they are minorities? She left this question to the community.

Jaelyn Domingo introduced the missions of the WISH club in California Polytechnic State University, which includes providing a community of support for womxn in computing majors and minors and rectifying the gender gap in the computing field. The club hosts Industry Talk to give opportunities to women for internships/jobs and manages the mentorship program that pairs upperclassmen to underclassmen so participants have someone to talk to if they meet problems in their class.

Jaelyn's major responsibility in WISH is to outreach to people in the central California community that was mostly underserved schools. They expose women in those younger ages, like kindergarten through high school, to computing and most of the students have not really had technology. Most of the participants in WISH are women, but some male allies joined the club recently. It shows more people are concerned to support the community.

Dr. Banawan proposed several strategies she learnt from some successful female scholars – women champions – in engineering and computational fields. First, the women champions usually find exemplars who pave the way for them as they subsequently evolve to become exemplars themselves. She has mentioned some women exemplars who have made significant contributions in the fields of artificial intelligence in education, affective computing, computational linguistics, and cognitive learning sciences. She has been fortunate to have worked with them or under their mentorship. These academic exemplars include Dr. Didith Rodrigo of the Ateneo de Manila University in the Philippines, Dr. Jaclyn Ocumpaugh of the University of Pennsylvania, Dr. Laura Allen of the University of New Hampshire, and Dr. Danielle McNamara, SoLET lab Director, Arizona State University. These women exemplars have established themselves in their respective academic communities and beyond. For young and aspiring women in academia, finding exemplars will not only give inspiration for success but a roadmap of how to navigate inequities and challenges.

The second strategy is to find value in establishing networks and connections, regardless of gender. Opportunities for collaboration are endless. From her experience, seasoned academic scholars were always eager to collaborate and mentor. Also, female scholars should be bold to take on leadership positions within and outside their circles. Taking on leadership roles will foster growth and help establish your own research identities. This leads to the third strategy, i.e. mentoring young women. She quotes Benjamin Disraeli: "*The greatest good you can do for another is not just to share your riches but to reveal to him his own*". Mentoring benefits both the mentor and mentee. Even as junior researchers, helping mentees will scale the knowledge transfer and bring about a cycle that will benefit entire communities and societies. She has observed that the women exemplars she has worked have many things in common, and one of these is that they were passionate mentors who paved the way for inexperienced researchers to feel more confident about themselves and what they could eventually bring to the table.

III. Feedback from TCLT

At the end of the panel, Prof. Maiga Chang – the Chair of TCLT – gave responses to the panelists. Starting from the ideas and challenges outlined in the panel, the TCLT will implement several actions, such as:

- setting up the award of the outstanding women in learning technology field
- supporting women who help TCLT as volunteers in various positions to apply for senior membership of IEEE
- increasing the opportunities of female scholars to join TCLT or ICALT organization
- encouraging participants to join the ICALT Future Collaboration Panel to enhance collaboration opportunities for female academics
- supporting mentoring programs to provide mentorship for students
- proposing the collaboration with student clubs for minorities, such as WISH
- encouraging male participants in TCLT to join the WiE Panel
- holding webinars for mentoring young women.

The TCLT is currently working with the Equality, Diversity and Inclusion team in the Department of Computer Science at the University of Sheffield. We are looking for mentors for the dissertation project for senior undergraduate students and speakers for the Spotlight Talks for high-school outreach activities. The TCLT will organize community volunteers to help build the inclusive environment for STEM areas. We encourage student clubs who are focusing on equality, diversity, and inclusion in the STEM education to contact the TCLT and we will support the clubs in different ways.

References

[1] M. C. Cadaret, P. J. Hartung, L. M. Subich, and I. K. Weigold, "Stereotype threat as a barrier to women entering engineering careers," *Journal of Vocational Behavior*, vol. 99, pp. 40-51, 2017.

[2] J. Christman, and R. Yerrick, ""She's More Like a Guy": The Legacy of Gender Inequity Passed on to Undergraduate Engineering Students," In *2021 ASEE Virtual Annual Conference Content Access*, July, 2021.

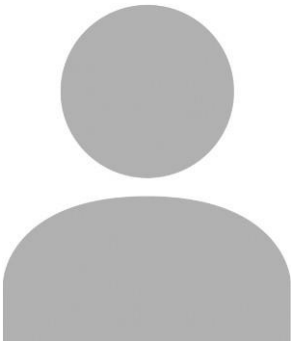
[3] National Academies of Sciences, Engineering, and Medicine, *The Impact of COVID-19 on the Careers of Women in Academic Sciences, Engineering, and Medicine.* Washington, DC: The National Academies Press. DOI: 10.17226/26061, 2021.

[4] U.S. Bureau of Labor Statistics, 2020, *Labor Force Statistics from the Current Population Survey*. Available: https://www.bls.gov/cps/cpsaat11.htm, Accessed on Aug. 30, 2021 [Online].

[5] IEEE Women in Engineering. Available at: https://wie.ieee.org.

Rita Kuo is a visiting assistant professor in the Department of Computer Science and Engineering, New Mexico Institute of Mining and Technology (New Mexico Tech). Her research interests include e-learning, computerized adaptive testing, computerized item generation, cognitive theory, intelligent agent, mobile learning, and game-based learning. She currently is the Vice Chair in EDI (Equity, Diversity & Inclusion) & Event in IEEE Technical Committee on Learning Technology (TCLT), the Editorial Board in Educational Technology & Society (ET&S), and the Chair of Education Gamification and Game-based Learning special interest group in Asia-Pacific Society for Computers in Education (APSCE). She is also a member of the Women in Computer Science (WiCS) program in the Department of Computer Science & Engineering in New Mexico Tech.

Michelle Banawan is a postdoctoral researcher in the Science of Learning and Educational Technology (SoLET) lab of the Department of Psychology in Arizona State University. She is working with Professor Danielle McNamara. Her research interests include: Artificial Intelligence in Education, Intelligent Tutoring Systems, Natural Language Processing and Machine Learning. She currently serves as chair of the AIED/ITS Special Interest Group of the Asia Pacific Society for Computers in Education.



Jaelyn Domingo was an undergraduate student in the Department of Computer Science & Software Engineering at California Polytechnic State University with Computing for Interactive Arts minor. She was the member of Society of Women Engineers and Hui-O-Hawaii student clubs. She was also the outreach director in the Women Involved in Software and Hardware (WISH) clubs in 2020-2021 term. She currently is a software engineer in Intuit in California, United States.

Elvira Popescu is a full professor at the Computers and Information Technology Department, University of Craiova, Romania. Her research interests include: technology enhanced learning, adaptation and personalization in Web-based systems, learner modeling, computer-supported collaborative learning, learning analytics, intelligent and distributed computing. She currently serves as the Vice Chair for the IEEE Women in Engineering Romania Section Affinity Group, Associate Editor for IEEE Transactions on Learning Technologies & Smart Learning Environments journal, Executive Board member for the International Association of Smart Learning Environments (IASLE) and member of the Women in Engineering Committee for IEEE TCLT.

Ramyaa Ramyaa is an assistant professor of Computer Science at New Mexico Tech. She did her PhD at Indiana University, USA, Post doctoral research at Ludwig Maximilian University, Munich and has masters degrees from Carnegie Mellon University, USA and University of Georgia, USA. She was a fellow at Simons institute of Theory, UC Berkeley, USA.

Her primary fields of research are Theory of Computation (and complexity) and Logic, focusing on implicit complexity (relating logical complexity of concepts to computational, resource-based complexity). Her secondary research area is Artificial Intelligence, focusing on machine learning.