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From the Editor

Dear readers of intWOJDE

We present our Volume: 12, Number: 1 issue to our valuable readers.

In this issue, there are four articles. We thank our authors for their valuable contributions to our journal.

The first article prepared by Nandana PRASAD and Dr. Norine WARK and entitled "Mitigating The Matilda Effect on Gila Kurtz: A Journey in Exploring Progressive, Pragmatic, and Promising Solutions for Online Learners". The aim of this article is to mitigate the Matilda effect on one exceptional female academic in online distance learning. This paper serves as a launch pad to enhance one female's poignant academic background and blended research interests. Gila Kurtz's accomplishments are recognized herein through a recounting of her academic background, research questions, and contributions to the field of education.

The second article entitled is "A Journey in Pursuit of The Brass Tacks: Ada Lovelace and Susan Herring, Computer Science Visionaries" written by Michelle KULYK and Dr. Susan BAINBRIDGE. The mainspring of this comparative inquiry is to examine two female pioneers who significantly impacted the agency of distance learning as it advanced within computer delivery: Susan Herring and Ada Lovelace.

The third article entitled is "Li Chen: Intersectionality Between The Matilda Effect and Anglo-Dominated Knowledge Production" written by Jen PORTER and Dr. Norine WARK. The purpose of this paper is to highlight the work of Li Chen and emphasize the depth and breadth of Chen's contributions to the distance education narrative. Li Chen is a visionary in distance education research and an influential advocate for the modernization of China's higher education system.

The fourth article prepared by Carolyn ANDERSON "Mitigating The Matilda Effect on Charlotte (Lani) Nirmalani Gunawardena: Bridging The Distance in Learning Environments". The purpose of this paper is to bring voice to the work of Charlotte (Lani) Nirmalani Gunawardena, an underrepresented female trailblazer who has greatly contributed to the field of distance education and online distance learning throughout her career.

We would be very happy to publish your studies on women and distance education in our journal. We hope to stay in touch and wish to meet in our next Issue, on October 2023.

Cordially,

**Prof. Dr. Emine DEMIRAY
Editor in Chief**

MITIGATING THE MATILDA EFFECT ON GILA KURTZ: A JOURNEY IN EXPLORING PROGRESSIVE, PRAGMATIC, AND PROMISING SOLUTIONS FOR ONLINE LEARNERS

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ABSTRACT

The term, *the Matilda effect* was coined to reflect the incongruencies in social equality experienced by Matilda Gage. Gage's work, as an abolitionist and suffragette, has had ripple effects that include the lack of recognition of innovative women researchers and scientists. This paper serves as a launch pad to enhance one female's poignant academic background and blended research interests. This academic is Gila Kurtz. Gila Kurtz's accomplishments are recognized herein through a recounting of her academic background, research questions, and contributions to the field of education.

Kurtz has delved into researching and writing about a variety of relevant open and distance learning (ODL) topics, such as popular technology platforms, with possible functions as learning management systems, or online spaces for synchronous and asynchronous collaboration. Her recent focus in the area of human interaction with technology lends insights into artificial intelligence and Internet of Things (IoT). While her career continues to evolve, it remains illuminated by her constant search for pragmatic and promising practices, tirelessly aimed at the betterment of student-centered instruction, whether the learners are faculty or students.

Keywords: Matilda effect, women researchers, distance education, artificial intelligence

INTRODUCTION

In 1993, Rossiter coined the term, *the Matilda effect*, to define the incongruencies in social equality experienced by Matilda Gage. An abolitionist and suffragette, Gage attempted to increase the recognition of women's contributions to the fields of science and art. Ironically, Gage's own work has now fallen into obscurity. Therefore, in the spirit of mitigating the Matilda effect on another intrepid female pioneer, this paper aims to highlight a lifetime of exceptional contributions by Dr. Gila Kurtz to the field of open and distance learning (ODL).

Gila Kurtz is currently the Dean of Faculty at the Holon Institute of Technology, based in Israel. Her academic background was founded in sociology and anthropology, which were furthered with a Master's in Public Policy. After completing a Doctorate in Political Science, she identified the need for distance education in her first position as an instructor at the Open University of Israel. As her own interaction with components of distance education increased, so did the pragmatism of her research interests and more recently, the interplay between humankind and technology. In fact, pragmatism and reflection have been key themes during Kurtz's academic career.

ACADEMIC REFLECTIONS

Kurtz' early learnings in sociology and anthropology were focal points for learner-centred research. As she advanced her knowledge in public policy, and then in political science, Kurtz took on a learner-centred approach, even in her own reflections of her academic competencies. For instance, she saw a gap in her knowledge around distance education and competencies, so she researched questions linked to issues in distance education for educators and for students, all of whom shared a common platform of learning together and from each other. Furthermore, when she received a teaching award as a visiting scholar in the United States, she reflected in an interview (Bainbridge & Wark, 2023) that she had always questioned her own ability as an English as a Foreign Language (EFL) learner to instruct in English, since this was not her first language. In reference to the award, Kurtz stated that, "It really touched my heart getting this teaching award" (Bainbridge & Wark, 2023, p. 267). The teaching award affirmed her competency of the English language, as she taught in an English-medium environment to native English speakers.

Kurtz reflected that her main goal in distance education was to increase the ease of accessibility and availability of education in rural and remote areas. With this thought in mind, Kurtz questioned her own competencies in distance education and strove to overcome them in the same manner that she conducted research.

Kurtz's primary research interests have consisted of digital learning and readiness, future learning technologies, and instructional design. Within each of these interests, she has an added element of pragmatism. Her student-centred research has been at the heart of her career, compelling her to generate solutions for increasing availability and accessibility to ODL.

A CHRONOLOGY OF KURTZ'S RESEARCH

In 1998, Kurtz captured the onset of distance education by studying the function of the satellite as a modality of transmission across time and space. At that time, distance education was delivered differently than it is today. She stated that learning, "was delivered online, by mail, by telephone, teleconferencing, broadcast television, video conferencing, and computer conferencing" (Kurtz, 1998, p. 87). Furthermore, the course package was paper-based and included all of the course materials (several subject units with assignments and quizzes), which were sent through postal carrier (snail mail) to the learner. Kurtz's early awareness of distance education in this traditional ecosystem evolved with the advance of online learning, and a learner population that became dispersed throughout the world. She raised questions about the implications of blended learning (Frank et al., 2002), and how best to transition faculty from their campus offices to the world wide web and online teaching (Kurtz et al., 2004).

As the transition from in-class and in-person instruction evolved into ODL, the advantages to online learning became increasingly visible. Kurtz sought continuous improvements in distance education, exploring more about challenges, gaps, learners' competencies, and then sharing these findings with colleagues.

Kurtz reported her findings on what helped or hindered ODL in several published articles. First, Kurtz et al. (2004) surmised that faculty at Bar Ilan University in Israel would have to change their roles as they transitioned from in-person classroom teaching to online delivery. As a whole new area in learning, her systems approach considered findings across faculty from Israel and North America. She had a foot in each space as she gleaned information around institutional, cultural, and technological facets of ODL. She included

competencies needed by distance education administrators responsible for supporting faculty who were directly responsible for creating an atmosphere conducive to learning in online teaching environments. Most importantly, Kurtz and her colleagues (2004) were concerned about how the transition from classroom to online learning affected student cohorts, as the role of the faculty in Israel changed from the "sage on the stage" to the "guide on the side." Faculty had to admit that the process of learning had diffused from faculty to students in ODL. Students took more responsibility for their online learning as they interacted with resources. In short, there was a greater degree of self-determined learning, or heutagogy (Hase & Kenyon, 2001) on the part of the students. In ODL, the culture of teaching had also altered. Technology played a minor role. Moreover, the institutional faculty, who had been taught about the facets of online learning, felt more engaged in online teaching than those who had not had any training or coaching.

Kurtz et al. (2007) recognized the opportunities and challenges of online learning. Their prior research on faculty transitioning to ODL led these researchers to further refine how, "online teaching differs from traditional one in a number of ways, including instructor and students' roles, communication, interaction and flexibility" (Kurtz et al., 2007, p. 85) when a change agent is part of the transition process. Theoretically, they surmised that learners passed through several stages as they gained online teaching practices while still ensconced in traditional classroom learning. The relevant stages discussed included: adoption of online learning innovation, deciding whether it worked for learners or not, and then confirming if instructors would continue to apply it, or recommend it for future learning. When 61 faculty members participated in the research project, the role of the change agent, the Bar-e-learn Center at Bar Ilan University, was assessed. Most faculty (76.8%) stated that their main reason for adapting to online learning was that they wanted to enhance their teaching to achieve levels of enrichment for students. A few faculty members (10.7%) felt that they were obligated. The remainder of the faculty were approached by the Bar-e-learn Center and accepted the recommendations of colleagues. The impact of the change agent was rated as very positive by most of the faculty members. All of this information was incorporated into the best approach to distance learning that Kurtz discovered over the years.

To explore more about the best blend or most promising practices, Kurtz then questioned core online competencies required by students to be successful learners across a diverse group of learners. The respondents, who self-identified either as American, Israeli, Mexican, or Japanese, were asked to share their stories as online learners. The team of researchers (Beaudoin et al., 2009), which included Kurtz, invited the 318 respondents, divided into four distinct cohorts, to help them better understand how learners engage and interact with teaching materials and resources, with their instructor, and with each other. Ideally, the researchers wanted to learn if online competencies were influenced by cultural orientation or any other factors. Once these core competencies and themes were identified, they were then disseminated for application to the students (end-users) and to the education and training designers.

A number of themes were identified by the students in the Beaudoin et al. (2009) study. The most effective and least useful specifications were revealed through the themes, enabling the developers to streamline the learning experience. For example, the majority of the learners, with diverse cultural orientations, viewed online learning in a positive light. The final list of factors deemed necessary to be a successful online learner were itemized from most important to least important. The first, or most important element, was acknowledged as self-motivation by the students who identified as American and Japanese, whereas it was ranked as second most important by students who identified as Israeli. Students felt that if they were not motivated, the outcome and impacts became self-evident in low completion rates. The element with the next highest ranking was time management, which was recognized by the students in the United States and Japan. As students engaged

in online learning, their ability to organize their time for synchronous and asynchronous sessions was related to their successful navigation through the courses and multiple deadlines while maintaining a work-life balance. Other core competencies included the capacity to learn with limited support, and interrelationships with online facilitators. Students from Japan and America stated that persistence and tenacity were major attributes in the self-designated learning environment, an environment marked by transparency and open communication between the learner and the instructor. A positive relationship between instructors and students was indicated through feedback, guidance, problem-solving, navigating technological challenges and final assessments. These relational connections were felt most by students from Israel; the other groups following closely behind.

Other elements with lesser importance were identified as: enjoying online learning challenges, the self-confidence to achieve learning objectives, the ability to express one's ideas while coping with the unstructured learning context, and finally, the connections with other online learners. Students' comments with respect to these elements highlighted that learning was a very individually-propelled action; it was enough to know there were others out there, without reaching out for collegiality and connection. In other words, the aspect of collaboration and communication to enrich learning within a cohort was not seen as an important factor. An interesting point to note was that Mexican students amplified the importance of an unstructured learning environment, while the other groups stated that online learners had to create their own structure, specific to their learning needs.

The final element, familiarity with technology, was much less significant, ranking last for students in Japan. This was likely because technology use either developed with time throughout the course, or that students already had technical skills related to online learning before enrolling in the course. Beaudoin et al (2009) summarized their suggestions for refining online learning through improvement of interaction between students' learning contexts and instructors, ease of technology use, enhanced course organization (with transparent learning expectations), and the addition of an in-person component. As these researchers mined information, it became apparent to them that the online learning environment was multi-faceted and highly complex. The online learning context was not a microcosm of the classroom-only context, and core competencies changed with time. Therefore, Kurtz persisted in her exploration of these topic areas.

Later in 2009, Kurtz et al. collected more information on learner populations to better understand their challenges, influences, and cultures in online learning environments. The findings indicated that learner self-determination was the motivational key to finishing school; even more so than institutional support. This insight led her to understand that learning was not driven by the learners' cultural context or their countries of origin.

On a more practical note, in 2011, Kurtz observed the universal rise of Facebook, and its applications in popular culture and communications. The phrasing that resonated in her writing was, "creating an ecosystem of lifelong learning through social media" (Porto et al., 2011, p. 107). One possibility emerged to use Facebook as a learning management system on its own. A second possibility integrated Facebook communications with a learning management system to enrich the learning population's engagement and learning through the application of this social media tool in the formal institutional environment (Meishar-Tal et al., 2012). The differences reported between a formal learning management system and Facebook were evident, yet the ease of interaction across cohort groups on Facebook, when it was used as a learning management tool, was cutting edge. It set a precedent when students reported satisfaction, resulting in the continued use of Facebook in further learning. Similar findings were reported by Kurtz (2013, 2014) in a follow-up study for the use of a Facebook group as virtual space for students' collaboration.

Tal and Kurtz (2015) continued to search for ease of access solutions for learners as they discovered the functionality of laptops, tablets, and smartphones in lecture settings. In this study, students self-reported that the use of the smartphone in lectures served as a distraction to learning, especially when personal and social messaging notifications were visible. On the other hand, the tablet and laptop were helpful in the lecture theatres and therefore considered to be more acceptable learning tools. At that time, these devices were emerging technologies and their potential uses for tertiary education were still being discovered.

Kurtz's research interests in digital learning and readiness, instructional design, and future learning technologies blazed her trail into artificial intelligence technologies. Kurtz's continuous exploration of information and communication technologies has now led her to conduct research on augmented reality and virtual reality functions, and robotics.

The phrase, *promising and progressive practice*, can be applied to Gila Kurtz, especially in the 21st century, as she forges improved pathways to knowledge for learners, whether they are faculty or students. Kurtz's work continues to include learners, who encompass a vast age range and diverse life backgrounds, in her relentless search to find the best blend of promising practices. For instance, her most recent research has involved exploring instructional strategies with Elders, using artificial intelligence.

In Kurtz's first research project, Elders were introduced to a humanoid robot (HR) that taught them how to navigate and understand their learning in a social media site (Kurtz & Kohen-Vacs, 2020). Elders were instructed on how to use Instagram as a mobile application in this interactive learning environment. The HR responded with questions, and offered input on the Elders' progress. When ten Elder participants were interviewed on their experiences with an HR as a motivational catalyst, their feedback included: how human the robot appeared, even though it never became upset; that the HR adapted to their pace of learning; and that learning could take place anywhere, since the HR could go online and was mobile.

In Kurtz & Kohen-Vacs' (2021) second project, a team of participants used a game-based approach to collaborate on decisions after receiving clues. This interactive learning environment was monitored by an HR. A team approached a series of tasks facilitated by an HR to achieve a collective goal in a time sensitive manner. Participants had to solve four questions (riddles) while engaging with the HR. This HR had affordances that included recognition of face and voice, broadcasting clues, and feedback through recordings. The researchers concluded that, as a motivational tutor, the HR was perceived positively.

CONCLUSION

The aim of this article is to mitigate the Matilda effect on one exceptional female academic in ODL. That academic is Gila Kurtz. The innovative, best blend of practices presented herein recounts Kurtz's lifetime devotion to research focusing on practical applications that address gaps in ODL. Her inclusive definition of learners (including herself) marks innovative, progressively pragmatic solutions that are relevant to our current century. In searching for the best blend of practices, Kurtz urges educational researchers to "[g]o beyond your profession" (Bainbridge & Wark, 2021, p. 269) to find interdisciplinary solutions. May this sage advice and Kurtz's work never be forgotten.

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A JOURNEY IN PURSUIT OF THE BRASS TACKS: ADA LOVELACE AND SUSAN HERRING, COMPUTER SCIENCE VISIONARIES

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ABSTRACT

The mainspring of this comparative inquiry was to examine two female pioneers who significantly impacted the agency of distance learning as it advanced within computer delivery: Susan Herring and Ada Lovelace. Ada Lovelace was a younger peer of the 19th century inventor, Charles Babbage. An aristocrat and amateur mathematician, she is often credited with writing the first computer program. Susan Herring is a contemporary linguist, and is considered the primary architect of the field of Computer-Mediated Discourse Analysis. She describes herself as “best known for my research on discourse and language use in online communication. Some people say that I am the founder . . . maybe even the leading person in the world in that area” (Bainbridge & Wark, 2023, p. 173). My prescription for this examination was to explore the field of study of each woman, their unique contributions, their shared commonalities and characteristics, and finally, their contemporary relevance to computer facilitated distance education. The journey was not straightforward.

Keywords: Computers, computer program, linguistics, mathematics, Sketch of the Analytical Engine, Computer-Mediated Discourse Analysis, online communication, gender

INTRODUCTION: OVERCOMING TRAVEL PREPARATION ANXIETY

My early considerations and reading brought doubt and insecurity; how could I possibly contribute to existing knowledge or further the understanding of the impact of these women in either their disciplines or on the development of computer science and distance education? This insecurity was amplified after reading Daniel P. Mc Carthy’s rejected submission, “Offprints of Ada Lovelace’s translation of Luigi Menabrea’s account of Charles Babbage’s Analytical Engine, Incorporating an Offprint by Babbage.” In the postscript, Mc Carthy includes the sharp assessment by peer reviewers for *IEEE Annals of the History of Computing*, who concluded that Mc Carthy’s analysis “[did] not add much to the Babbage literature, and its engagement with that literature [was] limited.” Further, the reviewers questioned “how relevant [was] this manuscript to the readers of this periodical? [Did] it increase the reader’s understanding of the development of computation, the computer industry, the application of computers, or some other aspect of history?” (2016, p. 17). This rejection slap undoubtedly stung Mc Carthy, and it cautioned me to ask the same questions: how relevant would my examination be, and could my narrative increase readers’ understandings of the significance and contributions of these women beyond existing literature?

Early stages: Investigating travel routes

Initially, I instinctively siloed Herring and Lovelace, as I beheld them in their distinct disciplines, one the linguist and the other a mathematician. I worried that to support any suppositions I hoped to unearth would require competent exploration into varied fields of linguistics, mathematics, computation, symbology, and so on. I cannot claim any credibility on these topics (one Facebook friend's son commented that my confusion on binomial distributions was at a grade six level). When I realized that the nature of this examination required comparison, I was tempted to knit Herring and Lovelace together via parallel threads in personal biographies: imagining unverifiable connections or regurgitating the musings and fanciful theories of others. I sought to discern analogies of personality, interests, methodology, aptitude, and even motivation. I rationalized this would not require that I consider the specificities of their disciplines, but rather the manner in which they, as women, undertook work in their fields and how they happened to venture into unique territory.

Upon appreciating that I may not be qualified to determine commonalities, a revised approach became evident, by which I viewed my task in a critically reflective manner. I came to consider: what if my contribution is not to further the body of knowledge, but to further constructivist and educational pursuit? What if my offering is the space of paper or binary breadth that is taken up with recounting not only my findings, but also recounting my journey of inquiry and exploration? What if the relevance is not through expanding the circle of knowledge of their fields, but rather in highlighting Lovelace's and Herring's process of pursuing what interests them with the passion for making sense of it—driven by induction to deductive pursuits. Ah—a voice, Susan, my co-author and mentor, tells me that this, my exploration, echoes that process.

[T]here are a variety of epistemological positions that coexist in the literature on how we construct knowledge—many using the same constructivist label . . . Common to each position is a belief that we construct knowledge based on what we already know (there is no tabula rasa) and that learning is an active rather than a passive process. (Kanuka & Anderson, 1999, pp. 4-5)

INTO THE JOURNEY—SETTING OUT WITH AUGUSTA ADA KING, COUNTESS OF LOVELACE

Coming through the portal of online education, I did not have any knowledge of the evolution of computer science or the logistics of computer delivery—what I call the “technical side.” Within my framework of distance education, I had never heard of Ada Lovelace. I had no idea what the Difference Engine or the Analytical Engine, designed by Charles Babbage, were and, even more, I had never read any poetry by Ada's father, Lord Byron; I was completely ignorant of Lovelace's story. Hollings et al. (2017) conservatively commented that “her life, as much as her scientific work, has inspired numerous biographies and creative endeavours” (p. 222). Ada's story has become fictionalized in everything from children's books to Sydney Padua's graphic novel, *The Thrilling Adventures of Lovelace and Babbage* (in which she has become a crime fighting heroine), and scrutinized in numerous biographies and intense appraisals of her work and contribution(s). An excess of accounts and opinions range from dismissive to over exuberant—controversy abounds. Hollings et al. note that “the search for heroines presents a distorted view of the overall development of computing . . . [and that] references to Lovelace far outweigh those to others with a much greater claim to influence” (p. 225). As I read, I again wondered how I could add anything to this soup that would be noticed amongst abundantly piquant narratives. I forged on.

The First Leg: Ada's Pre-story

Born Augusta Ada Byron in 1815, Lovelace was the only daughter of Anne Isabella Noel Byron and bad boy poet, Lord Byron. Hollings et al. (2017) claim that "early Lovelace biographers focused on the Byron family and then other later biographers analyzed her abilities and argued her intellectual and mathematical competence" (pp. 224-225). Quick Google searches of Ada (when married, she became Ada King, and then Countess of Lovelace) primarily describe her existence in relation to two men: first her father and his peripheral influences on her life, education, development, temperament, and "work," then on the other side of the fulcrum, she is defined by her curious relationship with Charles Babbage. Literature on Lovelace is abundant with analyses, critiques, controversy, fantasy, and mathematics. In her review of Padua's book, *The Thrilling Adventures of Lovelace and Babbage*, Etelka Lehoczky notes that as Lovelace has "become more widely recognized, even lionized, some scholars have dismissed her" (2015, para. 3).

Ada Interpreted by Contemporary Guides

I sought out credible authority from the 2015 University of Oxford Podcasts', "Ada Lovelace Symposium—Celebrating 200 Years of a Computer Visionary." Alexander Wolf, President of the Association for Computing Machinery and Imperial College London, introduced the symposium with the following comment:

ACM . . . owes a lot to people like Ada Lovelace for creating a discipline that has had amazing impact and whose impact . . . whose bounds I don't think we yet know or can appreciate. Ada Lovelace is clearly one of the heroes of computing and her name has really become synonymous with the birth of computing. (Wheeler & Wolf, 2015, 10:18)

This two-day marathon of 18 presentations, delivered by computer scientists, authors, poets, historians, and mathematicians, was "aimed at a broad audience of those interested in the history and culture of mathematics and computer science, . . . scholarship on Lovelace's life and work, and linking her ideas to contemporary thinking about mathematics, computing and artificial intelligence" (University of Oxford Podcasts, 2015). Topics ranged from the story of Ada and Charles Babbage and the computing machines, to Lovelace's impact on women in science, with titles like "Notions and Notations: Designing Computers before Computing," "Turning Numbers into Notes," and "Enchantress of Numbers," ending with the panel discussion "Enchantress of Abstraction and Bride of Science: Can Women Scientists Escape Being icons, Role-models and Heroines?" (These podcasts are available at: <https://podcasts.ox.ac.uk/series/ada-lovelace-symposium-celebrating-200-years-computer-visionary>)

In "Charles Babbage and Ada Lovelace: Two visions of computing," (Swade, 2015) presenter Doron Swade recounts how Ada met Babbage at a society event when she was 17 and was intrigued with his coffee table model of the Difference Engine. Swade sped past biographical details (the affordances of a privileged social position, society life, marriage to King, motherhood, rumoured gambling, financial woes, illness, and early death) to focus on Ada's grasp of Babbage's Difference Engine and her subsequent involvement in promoting the Analytical Engine. The British government advanced Babbage development funds, but the coffee table size model of the Difference Engine was all that Babbage ever produced, since he redirected his attention to the Analytical Engine. Of the Analytical Engine, his efforts yielded blueprints and drawings, written explanations, mathematical notations, and ambitions. Swade juxtaposes Babbage's writings on his engines with 26-year-old Lovelace's only published work, the 1843 translation of L. F. Menebrea's, *Sketch of the Analytical Engine Invented by Charles Babbage*. This sketch includes Ada's famous

extended notes in which she, more proficiently than Babbage, describes the never realized mechanical computing machine.

Full Stop Diversion from the Lovelace Symposium into Adjacent Territories

Distracted by Swade's reference to a contemporary model of the Difference Engine at the Computer History Museum in Mountain View, California, I innocently diverted to YouTube's *A Demo of Charles Babbage's Difference Engine* to watch Alan deliver a hypnotic demonstration of a model of Difference Engine No. 2 (Scoble, n.d.). When Alan traces out an equation to demonstrate the principle of finite differences, which was central to the design of the Difference Engine, I realized that, to understand the engines, I would need a sense of "the math." What started as a cursory look resulted in redirection through pre-calculus math, binomial distribution, the principle of finite differences, the history of binary code, industry in the Romantic era, jacquard loom evolution, player pianos, and even the history of IBM. My learning became "active" as I strayed in oblique directions.

Constituent Means/Engines: Jacquard Loom and Punch Card Technology

Joseph-Marie Jacquard patented the mechanical Jacquard loom in France in 1804. The loom used punch cards to reproduce designs in woven cloth. Punch cards controlled the loom using binary code—simply hole or no hole equated to raise or do not raise warp yarns. Christine Jeryan of Greenfield Village Museum provided me with a simple illustration of this technology in the video *How an 1803 Jacquard Loom Led to Computer Technology* (The Henry Ford, n.d.). F.G. Heath, in his 1972 account, "Origins of the Binary Code," tells us that "in a similar way Jacquard's loom is the ancestor of the many digitally controlled machine tools employed in modern technology. A more recent ancestor is the player piano" (p. 72).

In chronicling binary code use in digital computers, Heath explains that, for the design of the Analytical Engine, Babbage borrowed punch card technology, which was essential for programming: "that was a genuine application of binary coding" (The Henry Ford, n.d., p. 80). Punch card technology came to dominate information technology "with its 1928 redesign by IBM . . . [and] for nearly 50 years, it remained the primary vehicle for processing the essential facts and figures that comprised countless industries, in every corner of the globe" (IBM100, n.d.).

Ada's Math Voyage

Many biographers have examined and critiqued Ada's mathematical education and competency. Ada was schooled in mathematics first by her mother, then governesses and tutors. Hollings et al. (2017) detail her interest in natural sciences, astronomy, Victorian mechanical technologies, geometry, and mathematics, referencing correspondence with tutors and her mother's friend, physician William King:

Even in these childhood letters, we see an intelligent, inquisitive and tenacious mathematical learner . . . [and] what she needed, she said, was a course in pure mathematics, by which she meant basic arithmetic, algebra, and geometry: the extent of mathematical education for most men who went to university, and a level reached by very few women. (p. 226)

For his *Wired* article "Untangling the Tale of Ada Lovelace," Stephen Wolfram, like Swade, had access to many original documents and letters at the Oxford History of Science Museum, Bodleian, and other archives. He observes that "Ada's encounter with the Difference Engine seems to be what ignited her interest in mathematics" (Wolfram, 2015).

After 1840, Ada began to receive calculus and higher mathematics instruction from British mathematician and professor, Augustus de Morgan (Hollings et al., 2017, p. 222).

A Brief Tour of the Analytical Engine

In her presentation, "The Thrilling Adventures of Lovelace, Babbage and the Analytical Engine," at the 2017 Lambda Days conference in Krakow (February 9-10), cartoonist and author, Sydney Padua, describes the Analytical Engine: "this machine is famous as the first design for computer. It had a memory, was programmed with punch cards, and it had basically a CPU. This is the machine that Ada Lovelace also became obsessed with" (Erlang Solutions, 4:53). In the "Sketch of the Analytical Engine—Notes by the Translator," Ada stresses that "of course the cards must be made out accordingly" (1843, p. 692) and that the programmers must be skilled or, if not, then someone must know the *program* (mathematical law) that the engine is being requested to perform. Sydney Padua, in her blog post, "The Marvelous Analytical Engine—How It Works," presents a simulation of how the Analytical Engine would have worked; her computer animated model shows the "elegance" of the engine comprised of the mill, racks, store; and animates how the punch card, *holes or no holes*, do or do not activate the levers to read the numbers off on the store (Padua, 2015).

Charting the Bernoulli Equation and Note G

Ada is most famous for her additional extended Notes A and G that follow her translation of the sketch, or "Memoir," as she called it. In Note G, Ada uses a "mechanical notation" format to chart, or "trace," the operations or mechanical processes as they would be performed by the Analytical Engine to solve a Bernoulli equation. Swade argues that Babbage had previously developed this mechanical notation: "now, Babbage was sufficiently advanced in his, [*sic*] with the design ability to start programming in 1837, and between 1837 and 1840 he wrote twenty-four programs" (2015, 25:47). Attributed to Lovelace, Note G is considered by many to be the first computer program, but in his analysis, Swade rejects this, saying that:

This is what the fuss is all about. This is Ada's program of the Bernoulli's number solution... The seemingly dismal conclusion is that it is very difficult to identify features [in] Lovelace's Bernoulli example that do not have precedence in Babbage's earliest programming examples, or the derivative example to Menabrea. (34:13)

Note A: Imagining Future Directions

Ada's thorough grasp of the mechanics of the Analytical Engine and her broad vision across disciplines, enabled her to speculate or imagine the range of applications of a machine of this nature. Swade argues that Note A, "which was philosophical" (2015, 34:06), was her main contribution to computer science and that this prescience is her greater legacy, rather than the much-celebrated Note G (Swade, 2015). In Note A, Lovelace asks:

[M]ight [it] act upon other things besides *number*, were objects found whose mutual fundamental relations could be expressed by those of the abstract science of operations, and which should be also susceptible of adaptations to the action of the operating notation and mechanism of the engine. Supposing, for instance, that the fundamental relations of pitched sounds in the science of harmony and of musical composition were susceptible of such expression and adaptations, the engine might compose elaborate and scientific pieces of music of any degree of complexity or extent. (1843, p. 694)

Ada is contemplating the endless opportunities for “operations” and the multitude of possible applications of the Analytical Engine. This vision is Lovelace’s real contribution.

Weaving Patterns, Not Discovering Them

During his symposium presentation, Doron Swade repeats Lovelace’s famous quote from the sketch (p. 696): “we may say most aptly that the analytical engine *weaves algebraic patterns* just as the Jacquard loom weaves flowers and leaves.” But here Doron deviates from popular narrative by commenting that:

This is usually taken as some poetical flourish, but there’s an absolutely fundamental idea which is not usually associated with the Jacquard loom that I believe Lovelace . . . absolutely grasps. There’s the notion of universality and of specificity of function . . . The idea is, the machine, the loom can make any pattern. What specific pattern it produces is in the software, is in the cards. And Lovelace understands that the notion of a universal machine, and specificity of function—is contained in software in programs . . . And so, when she says the analytical engine weaves algebraic patterns, she’s talking about a generalized algebra machine that can do any form of mathematics provided the machine can be programmed to do so. A poetic flourish it is. (2015, 23:02)

Ada was clear that “the only truth herein is that the machine will duplicate and express the law without error—it cannot and will not test the law or prove the law, it must be programmed” (1843, p. 692). Hollings et al. (2017) note Alan Turing’s challenge to Ada’s assessment with “in his 1950 paper on whether a machine can think, Alan Turing challenged this view, which he called ‘Lady Lovelace’s objection’” (p. 222). Turing himself states that “the evidence available to Lady Lovelace did not encourage her to believe that they had it [the ability to think for oneself]” (1950, p. 450).

Ada Lovelace’s Prophetic Vision: The Progression of Computation and Computer Applications

Why was Lovelace’s contribution so important; what did Ada do? First, she had the interest and the perseverance to figure out if the Analytical Engine would work. In her notes, she undertook to follow the plans as devised by Babbage. She analyzed the drawings, the mechanisms and the “operational sequences”; she traced the programs, and then championed the Analytical Engine with a persistence abandoned by Babbage. Wolfram says that “Ada had an idea of what the Analytical Engine should be capable of” (2015). She foresaw its universal applications.

Swade asserts that:

Lovelace’s three contributions are . . . firstly, the transition . . . from calculation to computing. . . It was Lovelace who articulated for the first time that number could represent [an] entity other than quantity. . . number could represent letter of the alphabet, note of music. . . Secondly . . . she wrote that the analytical engine does not occupy common ground with mere calculating machines, it holds a position wholly its own. Finally, . . . Lovelace is asking, what does this machine signify? And to what extent is what it signifies important? Nowhere in his published writing or any of the manuscripts that I’ve looked at does Babbage right [*sic*] in this way (2015, 00:40:33).

Another symposium presenter, Lovelace researcher, and author, Betty Toole, describes years spent reading and contextualizing Ada’s available journals and letters. In her presentation “Ada Lovelace Lives Forever: Ada’s Four Questions,” Toole goes further in her interpretation of Ada’s vision, stating “that it should be more important for scientists and,

let's say computer specialists, to have imagination than it is for anyone else. It's primarily the discovering facility" (2015, 15:35). Toole continues to reference Ada's correspondence with a questioning letter Ada wrote to Babbage: "that letter, August 14th, I think is one of the most important letters . . . 'If the way I do things, she says, is for the benefit of mankind'" (24:49).

Toole continues:

[P]rophetically Ada's writings reveal a deep understanding of how much computing will change our society. . . In 1843, she once again implored Babbage and she did it in many ways. 'Stop being so tied up with this machine. It isn't really just about you. When we think about the future of computing, we need to ask ourselves whether we are using these amazing machines to create a better world' (2015, 00:27:57).

Thus, despite Lovelace's assertion that the engine could only do what you program it to do, Douglas R. Hofstadter, in *Godel, Escher, Bach: An Eternal Golden Braid*, believes that "Lovelace . . . was profoundly aware that with the invention of the Analytical Engine, mankind was flirting with mechanized intelligence" (1979, p. 25).

CHANGING DIRECTION: A LINGUISTICS EXPLORATION WITH SUSAN HERRING, ARCHITECT OF CMDA

Unlike Lovelace, Dr. Susan C. Herring is very much alive and not yet the subject of romanticized speculation or idolization (such as Lovelace in 'Enchantress of Abstraction and Bride of Science: Can Women Scientists Escape Being Icons, Role-models and Heroines'; University of Oxford Podcasts, 2015). Born 140 years after Lovelace, Herring is a distinguished "American linguist and communication scholar who researches gender differences in Internet use, and the characteristics, functions, and emergent norms associated with language, communication, and behavior in new online forms such as social media" (peoplepill, n.d.).

As with Ada Lovelace, I had never heard of Susan Herring, nor do I have any prior experience in the study or field of Linguistics. I had only heard of Computer-Mediated Communication briefly and just assigned it a perfunctory definition of having to do with the nature of communicating online. It was nothing to pay too much attention to—as it is something most of us do every day without considering it or the implications of it. When interviewed for *The Encyclopedia of the Female Pioneers of Online Learning*, Herring tells Bainbridge & Wark that "Computer-mediated communication is centrally involved in online learning, both formal and informal" (Bainbridge & Wark, 2023, p. 173).

Herring, a professor of information science and linguistics, is described as a data-driven researcher (Crumm, 2016). With little linguistics knowledge, this surprised me, as I had not really considered that systematic, methodical research is characteristic of the field of linguistics. Olivia Sammons, Assistant Professor Indigenous Languages and Linguistics, First Nations University, explained in a Zoom session to me that "linguistics is the scientific study of language, so it is data-driven" (Personal communication, January 07, 2022). The Linguistics Society tells me further that:

[L]inguists are scientists who apply the scientific method to questions about the nature and function of language . . . [they] conduct formal studies of speech sounds, grammatical structures, and meaning across all the world's [*sic*] over 6,000 languages . . . Linguists examine the relationship between written and spoken language as well as the underlying neural structures that enable us to use language. (The Linguistic Society of America, n.d.)

Herring's Pre-story

When interviewed by Bainbridge and Wark (2023), Herring describes starting her postsecondary education by “studying foreign languages . . . a French major as an undergraduate . . . I ended up studying twelve different languages, so I guess you could say that I was a language person. I went to grad school for Linguistics, and my interest in Linguistics was languages” (p. 176). Herring’s curriculum vitae (CV) on the Indiana University website lists her academic accreditations as Ph.D.–University of California, Berkeley, Linguistics, June 1991, M.A.–University of California, Berkeley, Linguistics, June 1982, and B.A.–State University of New York, Potsdam, French, May 1976, with her professional academic career starting as Graduate Student Instructor in 1981, and progressing from Associate Professor through to her current positions as Founder and Director of the Center for Computer-Mediated Communication, and Professor in the Department of Information and Library Science, School of Informatics, Computing, and Engineering, Indiana University, Bloomington (Herring, 2021).

Susan Herring Social Science Researcher: How the Path Emerged

Unlike Lovelace—whose only published work is her translation and notes on the Analytical Engine—Herring is a prolific author (she has authored or contributed to over 150 academic publications), primarily focusing on a real-world evolving and extensive study of computer-mediated communication. In her autobiography, anthropologist Zora Neal Hurston expresses that “research is formalized curiosity. It is poking and prying with a purpose. It is a seeking that he who wishes may know the cosmic secrets of the world and they that dwell therein” (1942). Herring’s early research topics reflected her study of languages, but her curiosity was also situationally resultant; she found herself studying Tamil at UC Berkeley and then in India. A Fulbright fellowship followed and Herring “did [her] dissertation research on oral storytelling . . . in Tamil . . . it was something completely different from what I ended up doing later on” (Bainbridge & Wark, 2023, p. 176), but signaled that interest and circumstance would guide the choices of Herring’s future research topics of interest. As C. W. Mills concludes in the *The Sociological Imagination*:

On Intellectual Craftsmanship: You must learn to use your life experiences in your intellectual work: continually examine and interpret it. In this sense craftsmanship is the center of yourself and you are personally involved in every intellectual product upon which you may work. (1959, Appendix)

Herring explains how her work in CMC emerged out of lived experiences. She recounts that she was an early Internet adopter in the 1980s when she returned to Berkeley:

Around 1985 I was using email and other forms of computer-mediated communication . . . My ex-husband was a research assistant in the cognitive science program; they had a server . . . he got me an account . . . By the late 1980s CMC was really expanding, and in particular, email mailing lists, or ‘listservs’ as they were called then, were starting to come into use in academic disciplines. (Bainbridge & Wark, 2023, p. 176)

When Herring started getting emails from the Linguistic Society of America in an “email distribution list,” she very quickly started to notice:

[I]nteresting gender patterns . . . [and] what was to become known as the ‘flame war’ conflict between followers of Noam Chomsky . . . and his generative linguistic paradigm on the one hand, and researchers who looked more at the social, contextual, and psychological aspects of language on the other hand. The argument was about who ‘owned’ the term ‘cognitive linguistics’. (Bainbridge & Wark, 2023, p. 177)

This “noticing,” or sourcing, from her life experiences (e.g., the online email conflict), led Herring to her first study on gender differences in computer-mediated communication. She prepared a questionnaire that was distributed to the participants in the list, and “collected all of the logs, the transcripts of the conversation, and conducted a discourse analysis of the transcript” (Bainbridge & Wark, 2023, p. 177). The data collection and subsequent analysis resulted in her research study “Gender and Participation in Computer-mediated Linguistic Discourse.” In her research paper, which was presented at the Annual meeting of the Linguistic Society of America in January 1992, Herring writes, “[I]t is concluded that gender-based communication preferences may inhibit women from participating in even professionally beneficial activities. Adoption of the rhetoric of male success is seen as a more participatory alternative” (Herring, 1992, Abstract). The response to this work was varied and unexpected, ranging from dismissal to hostility, with admonitions that Herring was pointing out bad behaviour by senior male scholars. One attendee even cautioned, “You are very brave” (Bainbridge & Wark, 2023, p. 178). Fortunately, as Herring was merely a junior linguistics scholar, many of the male scholars whose discourse she was analyzing did not attend her presentation.

Exploring CMC and Gender Differences in Online Communication

In those early years, “people didn’t really think that studying online communication was Linguistics because it was somehow more associated with popular culture, and linguists don’t usually analyze popular culture” (Bainbridge & Wark, 2023, p. 179). When Herring’s 1992 paper received more attention than her previous work in Tamil oral storytelling, it propelled her onto a path focused on CMC (p. 179). Herring recalls being influenced to work in the field of CMC by Sara Kiesler’s work on “social-psychological effects of computer-mediated communication” as well as the work of linguist Kathleen Ferrara’s “early pioneering study of the language that people used when they were communicating through a chat platform” (p. 179), and by the 1978 book, *The Network Nation: Human Communication via Computer*, co-authored by Starr Roxanne Hiltz and Murray Turoff.

Herring is considered a pioneer in CMC and is often consulted as an expert in the area of online gender CMC issues. From 1992 to the current day Herring has been interviewed for or quoted on this topic in 30 publications. In this condensed list of publications, we can trace how her research on gender-related topics has evolved, keeping real-time pace with ever changing online platforms and social media:

- “Gender and Democracy in Computer-mediated Communication,” 1993
- “Politeness in Computer Culture: Why Women Thank and Men Flame,” 1994
- “‘This Discussion is Going Too Far!’ Male Resistance to Female Participation on the Internet,” 1995
- “Posting in a Different Voice: Gender and Ethics in Computer-mediated Communication,” 1996
- “Participation in Electronic Discourse in a ‘Feminist’ Field,” 1998
- “Designing for Community: The Effects of Gender Representation in Videos on a Web Site,” 2002
- “Searching for Safety Online: Managing ‘Trolling’ in a Feminist Forum,” 2002
- “Women and Children Last: The Discursive Construction of Weblogs,” 2004
- “The More Things Change, the More They Stay the Same: Gender Differences in Attitudes and Experiences Related to Computing,” 2005
- “Being the Same Isn’t Enough: Impact of Male and Female Mentors on Computer Self-efficacy of College Students in IT-related Fields,” 2007
- “Implications of Gender Consciousness for Students in Information Technology,” 2008
- “Gender, Communication, and Self-presentation in Teen Chatrooms Revisited: Have Patterns Changed?,” 2011

- "Gender and (a)nonymity in Computer-mediated Communication," 2014
- "Teens, Gender, and Self-presentation in Social Media," 2015
- "Animoji Adoption and Use: Gender Associations with an Emergent Technology," 2020. (Herring, 2021)

Forging a Distinct Approach: Computer Mediated Discourse Analysis

In the 1990s, Herring recognized that CMC required a revised approach by which to study discourse. Herring explains that she created the "Computer-Mediated Discourse Analysis [CMDA] paradigm, which is a methodological tool kit that can be used to analyze online discourse from a variety of language-focused perspectives . . . I adapted methods of linguistic analysis to the specifics of different kinds of online communication" (Bainbridge & Wark, 2023, p. 181). In the 2004 chapter, "Computer-Mediated Discourse Analysis: An Approach to Researching Online Behavior," Herring explains the need for, and the characteristics of the CMDA's unique mixed approach within the framework of the scientific method:

[I]t may be supplemented by surveys, interviews, ethnographic observation, or other methods; it may involve qualitative or quantitative analysis, . . . can be used to address macro-level phenomena, [and the] CMDA approach allows diverse theories about discourse and computer-mediated communication to be entertained and tested. Moreover, . . . it is not a single method, but rather a set of methods from which the researcher selects those best suited to her data and research questions. (pp. 339-340)

When interviewed by graduate student, Flavio Souza, Herring advocated for the CMDA paradigm and methods, as they provided alignment with established praxis of scientific inquiry but, at the same time, she promoted exploring inductive and grounded approaches: "borrow from tried-and-true language focused methodologies; take what is useful from them. At the same time don't be overly reverential toward them; feel free to modify existing methods as needed to address new phenomena, or innovate new methods. Sometimes you need to let your methods emerge from the data" (Souza, 2015, p. 352).

Herring promotes CMDA's qualitative research nature. She says:

CMDA research does not take as its point of departure a paradigm, but rather observations about online behavior as manifested through discourse. . . a researcher is more likely to become interested in studying patterns of message exchange (for example), and then select conversation analysis as a useful methodological tool. In this sense, the approach is inductive—the phenomena of interest are primary—rather than deductive, or theory-driven. (Herring, 2004, p. 253)

Shifting the Research: Critical and Multimodal CMDA Study Exploration

Herring's methodical examinations and research into computer-mediated communication in multiple contexts highlights that human communication is far more than words or text; she acknowledges that the CMDA paradigm was created with a focus on the text-based platforms of email, chat, and text-messaging. As online platforms have become increasingly rich across media, her work has evolved to appreciate the multimodal possibilities for communication and adapt the paradigm to analyze those varied multimodal communications (Bainbridge & Wark, 2023, pp. 181-182). Herring's research interests expanded "to online language use more broadly, and then to the use of other semiotic systems—for example, graphical icons, what I call 'graphicons,' like GIFs, emoji, stickers, image memes, and so forth" (Bainbridge & Wark, 2023, p. 183). Concurrently from the mid 1990s, Herring's field of inquiry broadened to include online subjects concerned with

ethics, diversity, contemporary culture or zeitgeist, Internet access, and educational access. The sampling of topics below illustrates these shifts:

- "Linguistic and Critical Research on Computer-mediated communication: Some Ethical and Scholarly Considerations," 1996
- "Pedagogical Implications of Synchronous Computer Chat: Coherence *or* Equality?," 1999
- "Computer-mediated Communication on the Internet," 2002
- "Content Analysis for New Media: Rethinking the Paradigm," 2004
- "Collaborative Authoring on the Web: A Genre Analysis of Online Encyclopedias," 2005
- "A Longitudinal Content Analysis of Weblogs: 2003-2004," 2006
- "Questioning the Generational Divide: Technological Exoticism and Adult Construction of Online Youth Identity," 2008
- "Project-based Learning and Student Knowledge Construction During Asynchronous Online Discussion," 2010
- "Functions of the Non-verbal in CMC: Emoticons and Illocutionary Force," 2010
- "Cultural Bias in Wikipedia Articles About Famous Persons," 2011
- "Ebooks, ereaders, and ebook Device Design," 2014
- "Multimodal Communication on Tumblr: "I have so Many Feels!," 2014
- "ISIS vs. the U.S. Government: A War of Online Video Propaganda", 2015
- "Historical Insights for ebook Design," 2016
- "The Future of Robotic Telepresence: Visions, Opportunities and Challenges," 2016
- "Nice Picture Comment!" Graphicons in Facebook Comment Threads," 2017
- "Exploring Presence in Online Learning Through Three Forms of Computer-mediated Discourse Analysis, 2019
- "Do Emoji Sequences Have a Preferred Word Order?," 2020
- "Prompt-rich CMC on YouTube: To What or to Whom do Comments Respond?," 2021 (Herring, 2021, Curriculum Vitae).

WHERE THE ROADS CONVERGE: LOVELACE AND HERRING COMMONALITIES AND SHARED CHARACTERISTICS

In resisting the temptation to artificially weave Herring's and Lovelace's narrative together in a biographical manner, I looked instead to commonalities in their approaches to their disciplines. This required me to consider how they approached their inquiries; both women are motivated by what interests them. They seek to get to the core, or what I refer to as "the brass tacks," of a problem. They are not interested in merely recording or interpreting data, but rather in figuring things out at a fundamental level. Hollings et al. (2017) make note of "Lovelace's emerging mathematical strengths of attention to detail, interest in big questions, and desire to tackle problems from first principles" (p. 222). Both Herring and Lovelace are driven by induction to deductive pursuits. Wolfram suggests that Ada was able to imagine across disciplines...with a keen sense of industrial or operational process (Wolfram, 2015, pp. 5-75), as well as poetical science and imagination. Herring also pursues multi-disciplinary research into digital technologies, information science, CMC, linguistics, education, journalism, and social media (Bainbridge & Wark, 2023, p. 184). She continues to position herself and her research interests within the intersection of emerging technologies, semiotic systems, and ethnography.

CONCLUDING THIS NARRATIVE JOURNEY

Initially it appeared that it would be difficult to find connections between these women, not because of a void in contributions, but because the anchor points and circumstances for each are so distinct; it was hard to discern where their sets overlap. By the nature of her methodology, Herring collects data for linguistic analysis. Hers is a deep dive into how

electronic computerized communication has manifested, to identify probabilities and find patterns, and to explore the conjunction between the delivery system, the message, and human society. Lovelace's realm was in operational imaginings and tracing untested possibilities through math and cogs. She imagined, correctly, that via mechanism, the engine held the promise to take abstractions, mathematical formulas, musical compositions or communications, and make them concrete and replicable. Herring carries on with the realities of Lovelace's imaginings.

At some point in this inquiry (I am not quite sure when or where), I experienced a fleeting metaphor of insight and satisfaction—much as when you stir the cream into the coffee and get just the right colour—in which I visualized Herring and Lovelace together in the centre of this complex diagram, their sets overlapping. In this intersection, I saw the linguist and the mathematician wondering together about the evolution of computers; about communication conceived and interpreted by human minds, but produced and delivered with symbols and electronic mechanism; about the possibilities that digital technologies afford for digital and human advancement. Alan Turing concluded "Computing Machinery and Intelligence" with "we can only see a short distance ahead, but we can see plenty there that needs to be done" (1950, p. 460). I imagine Herring and Lovelace each surveying the short distance, then simultaneously re-focusing their lenses to consider future possibilities emerging from a broader, longer landscape. Individual interest is piqued for each as they seek to make sense of phenomena or processes that others don't yet even see; then they turn and set off on their pursuits.

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LI CHEN: INTERSECTIONALITY BETWEEN THE MATILDA EFFECT AND ANGLO-DOMINATED KNOWLEDGE PRODUCTION

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ABSTRACT

The purpose of this paper is to highlight the work of Li Chen and emphasize—for English-speaking audiences—the depth and breadth of Chen’s contributions to the distance education narrative. Li Chen is a visionary in distance education research and an influential advocate for the modernization of China’s higher education system. However, it is understandable that readers of English-based distance education publications might be unaware of her contributions. We find Li Chen at the crossroads of the Matilda effect (the absence of women’s voices from artistic, literary, and scientific narratives; Rossiter, 1993) and Anglo-dominated knowledge production. The Matilda effect and the absence of non-English speaking researchers from global discussions (Swale, 2004) are unfortunately well-established trends in distance education research. Finding oneself a casualty of either one of these phenomena might resign even the most prolific researcher to obscurity; even worse, finding oneself at the intersectionality of these would all but assure one’s absence from the research narrative. Chen’s research contributions have touched almost all areas of distance education including its epistemological and ontological underpinnings, the type and necessity of supporting ecosystems, and the importance of quality assurance. Chen’s work in connectivism and interaction have also served to further our philosophical and pragmatic understanding of distance education in practice. While Chen’s pioneering contributions are integral in Chinese distance education academia, her work has much to offer to other parts of the world as well. Diminishing the language barrier can assist in mitigating the Matilda effect on this outstanding academic.

Keywords: Matilda effect, women researchers, distance education, connectivism, anglophone knowledge production, intersectionality

INTRODUCTION

In *The Encyclopedia of Female Pioneers in Online Learning* (2023), Bainbridge and Wark used the interviews of 30 women who have had a pioneering impact on the trajectory of distance education to highlight the historical and current influence of the Matilda Effect on the discipline of distance education. A key feature of the women represented in this publication was their ability to communicate in English, a decision based on the notion that the “inception and expansion of the Internet and the expansion of the World Wide Web occurred in American institutions, spreading across North America and into other English-speaking countries, before expanding into the rest of the world” (p. 5). Li Chen is a distance education visionary from China and one of the pioneers representing “the rest of the world” (p. 5). Her research contributions include over 300 publications spanning across almost three decades; only a fraction of these are found in English language publications.

A deeper dive into Chen's research narrative shows that, even though educational technologies may have come later to China than the English-speaking world, the depth and breadth of her contributions have the capacity to influence, and in some cases direct, the work of her English-speaking counterparts. Conducting research outside an Anglophone ideology has allowed Chen to explore areas of distance education research and ask research questions that are not necessarily a dominant part of the Anglo "knowledge production process" (Mazenod, 2018). Concerns about the visibility of non-English-based publications, the research that they contain, and the inequalities in gaining access to participate and contribute to the global discussion are documented (Swales, 2004). In addition, when non-Anglophone contributions do break the veil of English-language research, the context and concepts they contain are often filtered through the dominant knowledge production ideology, thus far typically shaped by the world of English-speaking academia (Marginson, 2008).

It should be noted that the narrative below is constructed from the Google- and Microsoft-translated abstracts of Chen's work published in the leading education journals in China. Although flawed, the digital ability to translate these abstracts made it possible to introduce the broad scope of Chen's work to an English-language publication. However, the limitations of this approach are likely obvious and significant. The reality of these barriers represents an interesting intersectionality between the Matilda effect, globalization, and the affordances of the digital age when it comes to accurately capturing the contribution of distance education pioneers.

BIOGRAPHY

Li Chen's influence on the development and expansion of distance education in China can be evidenced by her participation on numerous national and international committees and working groups dedicated to the development and advancement of distance education. Chen's work as a consulting expert on the lifelong education system and mechanism construction group of the National Education Advisory Committee, a member in the Fifth Council of China Adult Education Association and the Academic Committee of the China Educational Development Strategy Society, the director of the Professional Committee of Distance Education in Colleges and Universities of China Society of Educational Technology, and the chairman of the Professional Committee of Computer Education for Primary and Secondary Schools of the Chinese Society of Education are just a few examples of her demonstrated commitment to changing and advancing the distance education landscape in China (Bainbridge & Wark, 2023).

Li Chen is currently the Vice President of Beijing Normal University and the Director of the National Engineering Laboratory of Internet Education, Intelligent Technology and Application, the Executive Director of the Capital Learning Society Research Institute, and the Chair of the National Natural Science Foundation of China, which is currently researching Educational Reform and Innovation Management in the Internet + Era. In addition, Chen is the winner of the 15th Beijing Philosophy and Social Science Outstanding Achievement Award for her work on the Principles and Strategies of Teaching Interaction in Distance Learning; work that she completed with Wang Zhijun, from Beijing Normal University, and her Anglo-counterpart, Terry Anderson, from Athabasca. Having spearheaded the development of China's only education program for distance education, she continues as a professor in the undergraduate (Basics of Distance Education), postgraduate (Distance Education), and doctoral (Theory and Practice of Distance Education) streams of the program. She also continues to supervise doctoral students in the Department of Education (Bainbridge & Wark, 2023).

High-quality education has interested Li Chen since her earliest time as a student. As she moved through her academic pathway, she found support for her interest in ensuring high-

quality education in her Master's supervisor. Finding this supportive environment encouraged her to shift her academic focus from electronics (satellite technology) to educational technology. Chen completed a Master's degree (1992) and a Doctorate degree (2003) in educational technology at Beijing Normal University. As the world of educational technology developed around her, Chen remained on the cutting edge of distance education research, exploring the impact of the Internet on transforming the entire educational system, including teaching structures, management structures, supply structures, and even the fundamental philosophy and principles underlying high-quality distance education (Bainbridge & Wark, 2023).

RESEARCH AREAS

China has the world's largest population of connected Internet users. Over 1.05 billion Internet users represent 74.4% of the population. (State Council Information Office People's Republic of China, 2022) Given those statistics, there is a great opportunity for distance education to play a key role in the reform of China's education system. A project Li Chen has tirelessly advocated for through her committee participation and supported through her research efforts.

Chen has driven the reformation of education projects in China with her work investigating the innovative and systematic spaces of the distance education frontier. These investigations centered on exploring the epistemological foundations of knowledge, connectivism (Siemens, 2005) as a driving theory of learning and knowledge (in particular, the emphasis on interaction), and the importance of quality assurance to the success of distance education efforts. The summary below of her work in these research areas only begins to highlight her contributions. The limitations of exploring her research through Google-translated abstracts do only minimal justice to capturing the complexity, reach, and ideological and epistemological variance of her research narrative. This limitation highlights the need for better cross-cultural, cross-linguistic, and cross-geographical efforts in research dissemination that do not rely on the *privilege* of English-language publication.

TOWARDS A NEW ONTOLOGY, EPISTEMOLOGY, AND PEDAGOGY

Pursuing a modern education system in China must begin with a reconceptualization of knowledge and how we can come to know it. In *Reconstructing the Epistemological Basis: A New Concept of Knowledge for Lifelong Learning in Adults* (2023), Chen et al. posit that the view of knowledge is directly related to the ways in which we can conceptualize and understand education. The limitations of traditional knowledge concepts, how it's organized, valued, produced, and disseminated, restrict innovation in educational theories and practices. In addition, the introduction of the Internet and big data to teaching and learning practices allows us to measure teaching and learning behaviours in ways more amenable to a natural sciences approach to knowledge opening the epistemological potential of developing foundational laws and principles (Chen, 2019).

Post-Internet or Net-informed learning theories emphasize emergence and generativity, and are meant to include learning that occurs and is stored outside of the individual. With knowledge growing exponentially and technology impacting learning processes with an intensity not experienced in previous eras, many of the learning processes described in pre-Net theories are now increasingly provisioned by technology. The influence of the digital medium on the learner re-positions learning as an external event that emerges from the learning system and necessitates different engagement and navigational skills from the learner (Siemens, 2005). The capability for far-reaching and cost-effective communications, the sudden shift to a large quantity of easily accessible information, and the real and automated agents that create, accrue, curate, and parcel information have

produced a brand-new learning landscape that might require new theories to navigate. Connectivism grew quickly as a potential learning theory when technology became ubiquitous in teaching and learning spaces. Our relationship with information and knowledge changed as we entered what some have called the Fourth Industrial Revolution (Ally & Wark, 2020; Schwab, 2018). Although Connectivism's learning theory status is debated, it does exist within a unique ontological and epistemological space, which would give the emerging perspectives a distinct place among existing learning theories.

In terms of how knowledge is valued, Xu et al. (2020), and Chen, Xie, and Zheng (2022) promote a move to open lifelong learning as a guiding influence for systems-level educational decisions. A lifelong learning approach represents “个体层面满足生存和幸福需要、在组织层面激发创新能力、在社会层面实现可持续发展的价值体系 [a value system that meets the needs of survival and well-being at the individual level, stimulates innovation at the organizational level, and achieves sustainable development at the social level]” (Chen, Xie, & Zheng, 2022, p. 1). Modernization of the system should embrace the flexibility and personalization required to support learners across their lifespan; however, the momentum and innovation required to support equitable and lifelong learning must come from embracing a new concept of knowledge. Chen et al. (2023) and Chen et al. (2019) describe the three stages of knowledge conceptualization. First, the objective attribute perspective defines knowledge as facts, ideas, and other things to know. Second, the social attribute perspective defines knowledge as relational. It is created, revised, and transmitted through social interactions and is embedded in social relationships. Finally, the network attribute perspective defines knowledge as emergent and problem-driven. It evolves, is remixed, disseminated between nodes, and produced more efficiently as it makes contact with new groups and their subsequent networks.

In terms of how knowledge is organized, produced, and disseminated, Wang and Chen (2014) promote the adoption and further exploration of Connectivist learning theory. Connectivism aims to accept the complexity of the system rather than struggling to dismantle it (Siemens, 2005). It promotes using behavioural data, such as learning analytics and social network analysis, to determine the impact of the learning environment on learner behaviour and how the learner interacts with the learning environment. These large data sets provide insight into the complexity of the learning system and allow for a holistic, rather than a structural, understanding of that system (Moon & Blackman, 2014). Connectivism borrows from the principles of heutagogy, distributed cognition, activity theory, chaos theory, network theory, complexity theory, complex adaptive systems, and other self-organizing theories to position learning as an emergent and generative occurrence equally achievable by learners and organizations, specifically through their utilization of technology and digital affordances (Dron & Anderson, 2014; Siemens, 2005; Wark, 2018).

In Connectivism, learning is no longer positioned as an individual experience resulting in individual changes to their ability to act; instead, our knowledge and competencies exist in our connections with others. Others become the proxy for knowledge and competencies. Learning can exist outside the self and replicate and compound through the small efforts of many. As Lu and Chen (2019) describe “互联网时代的学习者群居而生。“互联网+”时代的课程观已然发生转变,课程不仅具有知识传播功能,还具有知识生产、关系网络和社区等属性。本 [Learners in the Internet age live in groups. The curriculum concept in the "Internet+ era" has undergone a transformation, and the curriculum not only has the function of knowledge dissemination, but also has the attributes of knowledge production, relationship network and community roots]” (p. 1). The goal of Connectivist learning is not about the transmission of information. Or the transformation of information into knowledge through

meaning-making. Instead, the goal is to be able to identify, traverse, and generate connections between people, nodes, and networks (Anderson, 2010).

Pedagogical approaches focus on building systems and connecting networks where learning can emerge. Learners develop the skills to continually expand these networks. This skill set positions learners to exponentially grow, without biological limits, their capacity to know more than they currently do (Anderson, 2010). The learning environment for connectivists is developed across three distinct contexts. First, the group likely gathers in a familiar closed environment, such as the online classroom or Learning Management System (LMS). There is a hierarchical structure of leader (teacher) and followers (students); participation in the group only occurs while actively engaged within its organizing system (course, semester). Participants are engaging with learning, independently and collectively. Second, the network extends learning beyond the closed system to a voluntary community where membership changes often and is less temporally bound. Community members are typically purpose-focused and engage the network when there are specific problems or challenges that they are trying to solve (for example, in a Community of Practice). However, rather than accessing this community upon some mastery of knowledge or skills, the learner connects with this network to build their knowledge and skills. The community then becomes an extension of the learner. Third, the collective, which represents the largest and loosest connections, gathers and integrates activities across the Internet to solve problems, and to form new nodes and pathways to facilitate easier connections and foster dialogue (Anderson, 2010; McHugh, et al., 2016).

A Connectivist pedagogy designs environments in which learners participate simultaneously in each of these contexts, creating a dynamic system that supports learning and strengthens knowledge and understanding through the extension of personal networks (McLoughlin & Lee, 2008). Chen's work on interaction serves to highlight mechanisms by which interaction, a foundational component of all distance education, and cognitive engagement occur in teaching and learning environments that embrace the generative and emergent design elements of Connectivism. Chen's early interaction research highlights the need for a more defined language set to allow for a systematic investigation of the nuances of interaction, and a call for the literature to more precisely define their interaction variables. Chen argues for the inclusion of a structural analysis (teacher, student, student-teacher, teacher-content, student-content, student-student, and so on), a functional analysis (operational interactions, informational interactions, and concept interactions), and a complexity analysis (simple-complex or concrete-abstract) in any investigation of interaction concepts (Chen, 2004a).

To assist in understanding this more nuanced definition of interaction, Chen (2004b), developed a conceptual framework. Extending Laurillard's (1999) conversational framework, Chen developed the hierarchical model for instructional interaction (HMII). This framework summarizes the different meanings, and highlights the interdependence of each level of teaching interaction. By describing teaching interaction, Chen also provides key insights into the mechanisms of distance learning.

This conceptual framework was furthered in the work by Wang et al. (2014), when Chen and her colleagues extended the framework to include the networked nature of Connectivist learning environments and the kinds of cognitive engagement that occur at each level. This updated framework defines the supporting and influencing function of each level and the iterative nature of the overall framework.

Wang and Chen (2015) argue for the need to understand the interaction and engagement phenomena in Connectivist learning theories in order to better develop pedagogical practices. The frameworks attempt to capture the complexity of the Connectivist learning environment and its emphasis on both the individual and the learning system. At the individual level, learners are supported to achieve self-identified learning goals by helping

them identify social and physical structures, and influences that may act as support or barriers to the emergence of effective adaptive behaviour. This ability to navigate the learning environment equips and empowers learners to survive and influence the learning system. Shaping Connectivist learning environments is done through creating, sharing, mixing, and remixing the knowledge stored in the nodes and networks of the Internet. This change in outlook and approach ensures learners develop and practice the skills needed to survive and thrive in the knowledge society.

In addition to using connectivism to reimagine knowledge and how we come to know it in the digital age, Chen proposed using connectivism to shape a modern education system. Wang and Chen (2019) discuss the transformation of education in the information age and point out that education is a complex system that might be better understood and influenced from the place of complexity theory. Wang and Chen (2019) highlight the need for an educational ontology and posit that connectivism is just that ontology. If we adopt this ontological starting place, then a modern distance education system embraces three core ideas. The first is connectivity at the learning level, reflected in the integration of cognitive, conceptual, and social networks. The second is connectivity at the teaching level, reflected in resource sharing, open universities, and blended learning. The third is connectivity at the organizational level, reflected in new educational ecologies such as self-organization and community-based education. It is at this final level that Chen has directed her most recent research efforts, exploring the innovative potential for connectivism to inform educational reform in China (Chen et al., 2023).

TOWARDS A NEW EDUCATIONAL ECOSYSTEM

In *The Opportunity and Challenges for Distance education in the Era of Internet+*, Chen et al. (2016) identify a gap between the direction of educational reform (influenced by the Internet) and the direction of distance education. The direction of distance education emphasizes strengthening and improving the traditional education system through access to enhanced hardware and software and increased technical support. Chen et al. (2016) use the term, *Internet + Education*, to signify that they are referring to reforming the entire educational ecosystem, including infrastructure, supply, governance, resources, and professional development. The Internet has not only promoted innovation in distance education, but has also ushered in a new business model, which is impacting the changes in the education system. Chen (2018) argues that this is a historic opportunity for the modernization of China's education system, but if it is not approached with intention, it might be an opportunity missed. Chen (2018) emphasizes that “教育信息化的价值取向不是技术应用,而是破解教育问题,使教育更符合社会及人的发展需要 [the value orientation of education informatization is not the application of technology, but to solve the problem of education and make education more in line with the needs of social and human development]” (p. 1), and that ensuring these values are embedded in the evolving system is an important part of educational reform. While maintaining these values, the education system must shift from simple to diverse, from standardized to individualized, from integrated to fragmented, and from centralized delivery to flexible delivery (Bai et al., 2021). These shifts require that the “专项行动计划的核心内容,全面构建以学习者为中心的教育服务体系,建立基于数据的多元主体共治体系和消费驱动的教育教学服务与评价体系,建设高质量的开放教育制度体系。 [The core content of the special action plan is to comprehensively build a learner-centered education service system, establish a data-based multi-subject co-governance system, and a consumption-driven education and teaching service and evaluation system, and build a high-quality open education system]” (Bai et al., 2021, p. 1).

Chen's work promoting educational reform was accelerated during the COVID-19 pandemic. By summarizing the practical experiences of large-scale deployment of online learning, Chen, Zheng, and Xu (2022) demonstrated that China's education system has, in fact, begun to move into a new stage of development and implementation. This new stage has introduced new areas of emphasis for educational governance by promoting educational equity, developing an evaluation system to measure high-quality education, enriching the supply of educational programming, and improving managerial decision-making strategies (Chen, 2022). The reformation of the educational system would not be complete without some discussion of the changes required in teaching practice and the subsequent innovations in teacher training methods. Using case analysis, Gao et al. (2022) demonstrate that “**创新教学方式与教学组织形式、创新教学评价方式、创新教师培育方式、建设终身学习新体系是深化教学改革的重要着力点，同时认为创新教育服务供给新单元** [innovative teaching methods and teaching organization forms, innovative teaching evaluation methods, innovative teacher training methods, and the construction of a new lifelong learning system are important points for deepening teaching reform]” (p. 1), positioning teaching reform as the final pillar of a reformed educational ecosystem (Yaqian et al., 2022).

The essence of a high-quality education system is one that encourages and supports lifelong learning. For lifelong learning to be of value, a qualifications framework must be established at the national level (Chen, Zheng, Xie, et al., 2013). As it currently stands, the Higher Education Law sets out the length of full-time study required for each credential level, and many institutions have adopted the credit system to increase choice and flexibility as they adapt to a more market-driven and knowledge economy. In addition, introducing tuition fees to the previously-funded system has also opened institutions up to the potential of a consumer-oriented qualification system. China has over 2000 higher education institutions offering either educational qualifications or academic degrees. Higher education institutions are classified as either Regular institutions and Adult institutions (the majority of which are public), or Private (Minban) institutions, which are often viewed as lesser quality (International Qualifications Assessment Service, 2020). The complexity of the structure of the higher education system is one reason why a national qualification framework remains an incomplete project in China's educational reform efforts.

The official launch of open education in China was marked in 2012 by the approval of the state to establish the Open University of China, Beijing Open University, Shanghai Open University, Guangdong Open University, Jiangsu Open University, and Yunnan Open University from their respective Radio and Television Universities (Zhang & Li, 2019). The permission to operate was only the first step to establishing open education as a viable option. Now there was the very pragmatic question of how to break into the higher education system and ensure open education was viewed as a high-quality option for lifelong learning. In *The Responsibility on Improving the Quality Reputation of Distance Education for China Open University* (2013), Chen, Zheng, and Yin outlined the challenges faced by the Open University and recommended that they focus on reforming the quality reputation before increasing their offerings. The pursuit of quality was challenged by a research and practical landscape riddled with contradiction, competition, and general disorganization. Systematic research on what dimensions or key points should be included in a quality-assurance model was lacking, and so far, no institution has developed a comprehensive quality-assurance model (Li et al., 2021).

Chen and colleagues propose what they call an “*internal driving force*” perspective on quality assurance, which highlights the need to develop a culture of quality within an institution. In this perspective, the driving forces of quality assurance should come from quality awareness by institutional leadership, student demand, and policy development. However, external forces, such as industry requirements and institutional competitiveness,

cannot be overlooked and should be controlled for in any comprehensive quality assurance model (Li et al., 2021). Survey work by Shuang et al. (2021) looked at questions and answer responses from over 25,000 people between 2011 and 2021 and highlighted some of the concerns that online education (and therefore, open universities) must address. Most significantly, the participants continued to identify online education as not being as good as other forms of education, making the key issue for online education and open universities a public relations one. In an article to celebrate the 10th anniversary of the open education movement, Chen reiterates that the direction of the Open university should always be towards a lifelong public service system that opens up high-quality education for all (Wei et al., 2022). She remains invested in the research and committee work that strives to make it a reality.

CONCLUSION

Chen's research narrative over the last two decades has supported education reforms in China. Modernizing education in China has required an ideological shift that stems from the philosophical underpinnings of knowledge. Chen's research—that builds towards a new ontology, epistemology, and pedagogy—redefines learning as a lifelong process, and embraces and promotes a Connectivist view of knowledge. *Knowledge* is newly defined as generative, emergent, and uniquely embedded in the digital affordances of the information age. This view of knowledge has allowed for a reconceptualization of learning and the establishment of new rules of learning (such as the fore-fronting of interaction in distance education design and delivery). The second avenue of educational reform requires a move towards a new educational ecosystem that can incorporate and support new perspectives on learning and modern pedagogies. Chen's research in these areas has highlighted the importance of infrastructure, supply, governance, resources, and professional development to the modernization and reform of the educational system. Finally, the maintenance of education reform requires a focus on quality assurance. Chen has been a strong advocate for a nationwide qualifications framework and quality assurance best practices that support institutional and course-based quality mechanisms for distance education.

The overview of Li Chen's work provided in this article is only a sampling of her research contributions. Her other contributions and research oversight in cMOOC development, artificial intelligence in education, and the use of data analytics, such as social network analysis, are of equal impact on the advancement of distance education. Given the depth and breadth of Chen's contributions to the education literature base, the geographic and language barriers reinforce the challenges and bias outlined by the likes of Mazenod (2018), Swales (2004), and Marginson (2008). The absence of Chen's work from the English-dominated narrative on distance education, and the gap that leaves in our construction of knowledge in this area, is an example of just how important the "rest of the world" (Bainbridge & Wark, 2023, p. 5) voices are to a fulsome understanding of any research area. As Bainbridge (2016) highlights, "by following the colonial view from a western perspective and assuming that all *important* research is published in English, then according to current world population statistics academic research is serving approximately 15% of the earth's people" (para. 5). While it is true that digital affordances have increased access through digital archiving, digital publishing, and readily available language translation services, their flaws and inaccuracies in representation, nuance, and context keep non-English publications from being fully embraced by English-speaking researchers. The solution to these issues is beyond the scope of this article. However, when considering the impact of the Matilda effect on our understanding of the distance education research narrative, we must not forget the complexities of the intersectionalities that are also present and often unaccounted for.

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MITIGATING THE MATILDA EFFECT ON CHARLOTTE (LANI) NIRMALANI GUNAWARDENA: BRIDGING THE DISTANCE IN LEARNING ENVIRONMENTS

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ABSTRACT

The purpose of this paper is to bring voice to the work of Charlotte (Lani) Nirmalani Gunawardena, an underrepresented female trailblazer who has greatly contributed to the field of distance education (DE) and online distance learning (ODL) throughout her career. This paper explores her educational experiences, research interests—particularly in the areas of increased access to higher education, culture, social presence, and instructional design in connection to DE and ODL. It highlights her many contributions to this field and, this paper shares proud moments of her career to date—in her own words. This paper aims to pronounce Gunawardena’s contributions by illuminating her dominant work in the sociocultural context of online learning, social presence theory, and culturally inclusive instructional design.

Keywords: Increased access, social presence, instructional design, sociocultural, online distance learning, Matilda effect, Charlotte Nirmalani Gunawardena

INTRODUCTION

In an interview on MOOCs organized by The Guardian Newspaper in the U. K., Extreme Learning Series (Gunawardena, 2014), Charlotte Nirmalani (known as “Lani”) Gunawardena suggested that educators re-imagine education to focus in on how the digital learning environment can deliver learning in a different way. She said the future is about people collaborating with each other, such as we are seeing with social media, and that the collaborative nature of learning, the mentoring and support for students must be built into online learning through people and artificial intelligence (AI). Lani’s ability to traverse the various landscapes and multiple layers of the digital learning environment, and connect them to student needs in contextual ways has been a successful, career-long endeavor. Her contributions to the field of distance education (DE) and open and distance learning (ODL) are vast, with more than 125 publications to her credit, plus interviews, conference proceedings, and much more.

Lani currently maintains the position of Distinguished Professor of Online Education and Instructional Technology in the Organization, Information, and Learning Sciences (OILS) program, College of University Libraries and Learning Sciences, at the University of New Mexico. She “founded and developed the graduate emphasis area in distance education in the OILS program and has thirty years’ experience teaching about distance and online education” (University of New Mexico, n.d.). Lani is a female pioneer of distance education and online distance learning who has prominently advanced online learning. “She has extensively worked on culture and distance/online learning; social technologies, online learning, and socially mediated metacognition; social presence theory; social content of digital learning, and social construction of knowledge in online learning communities” (Bainbridge & Wark, 2023). Although much of her career has been spent in the United States, Lani’s love of education and learning began in her birth country, Sri Lanka.

LANI'S EDUCATIONAL BACKGROUND

Born in the tropical island nation of Sri Lanka, Lani studied at Ladies' College, Colombo, and obtained her bachelor's degree in English (Honors) from the University of Sri Lanka. She taught English as a Second Language and elementary French at Museus College, Colombo, and worked as a Research Assistant in English for Specific Purposes at the Department of English, University of Colombo.

Lani completed a Master's degree in education with an emphasis on Teaching of English to Speakers of Other Languages (TESOL) at the University of Kansas in the United States. She completed her doctorate in Curriculum and Instruction, also at the University of Kansas (Gunawardena, n.d.).

After completing post-doctoral studies as a Kellogg Research Fellow at the University of Oklahoma, Lani joined the Training and Learning Technologies Department (later named the Organizational Learning and Instructional Technology program), in the College of Education at the University of New Mexico as an Assistant Professor of Distance Education and Instructional Technology in 1989. This was to develop the graduate emphasis in DE.

She now serves as a Regents' Professor in the Organization, Information, and Learning Sciences program in the College of University Libraries and Learning Sciences at the University of New Mexico. In her teaching and research activities, she continues to pursue her passion for online learning, blending it with her keen interest in intercultural communication (Gunawardena, n.d.).

LANI'S PASSION FOR DISTANCE AND ONLINE LEARNING

In her keynote address to Northern Kentucky Universities' Summer Online Faculty Institute, Lani relayed her passion for distance learning began after high school graduation when her friends did not make it into university. She stated country-sponsored universities in Sri Lanka only allowed entrance to 14 percent of applicants (Gunawardena, 2021). Lani was accepted and completed her undergraduate degree in English at the University of Sri Lanka in 1976, but it was the lack of educational opportunities for others that prompted her to continue her learning beyond her undergraduate degree.

It was during the pursuit of her doctoral degree in Curriculum and Instruction at the University of Kansas that Lani began to consider how media could provide increased access to education (Bainbridge & Wark, 2023). Prompted by a suggestion from her father that she investigate how television could support the learning process, Lani began to consider how media influences learning. In an interview with Bainbridge and Wark (2023) for their book, *The Encyclopedia of Female Pioneers in Online Learning*, she shared a story of when she was an intern at the Division of Continuing Education at the University of Kansas and was provided the opportunity to evaluate a course for them that utilized a television component. The course was called "Brain, Mind, and Behaviour," and used the "PBS (Public Broadcasting Service) program as a video component to assist learning in the correspondence course" (Bainbridge & Wark, 2023, p. 141). Her work in this project acted as a catalyst for Lani to focus more in-depth on the intersection of media and distance education.

Lani's doctoral studies included a large emphasis on Instructional Technology and a minor emphasis on Instructional Television. She completed her doctorate with honours and, in 1988, won the National University Continuing Education Association's Charles A. Wedemeyer award for her dissertation, *New Communications Technologies and Distance Education: A Paradigm for the Integration of Video-based Instruction* (Gunawardena, n.d.).

In her career quest to find ways to create increased access to education, Lani strongly emphasizes that this is reliant upon the provision of access as a critical piece. She states, "How do you provide access to people who don't have access? I work with many Native American students who live in reservations here in New Mexico and they're extremely remote. Sometimes they don't really have good Wi-fi connections. In fact, one student told me, 'I have to really take my truck and go up the hill and join your Zoom meeting from there so I might lose my connection.'" (Gunwardena, 2021). One of the things we really must do is make accommodation for those who cannot access educational offerings (Gunawardena, 2021).

In *Addressing First-and Second-Order Barriers to Change: Strategies for Technology Integration*, Ertmer (1999) calls external factors, such as adequate access, time, training, and institutional support, as first-order barriers that are extrinsic to teachers. In similarity to Lani's story about Wi-Fi issues for Native American students in New Mexico, Indigenous communities in Canada are disproportionately affected by the lack of broadband Internet access. In a HillNote article for the Library of Parliament, Collier (2021) wrote about how the lack of broadband Internet access in Indigenous communities exacerbates long-standing inequities in areas such as health, employment, and education in Canada. He states that, even where broadband Internet is available, it still may be inaccessible to Indigenous People due to cost and/or lack of digital devices (paras. 5-6). In 2019, the Canadian "government released a strategy aiming for all Canadians to have access to 50/10 Mbps by 2030" (para. 9).

Second-order barriers, which are intrinsic to teachers, include their personal and fundamental beliefs, such as pedagogical and technological beliefs, as well as the willingness to change and best meet the needs of their learners (Tsai & Chai, 2012). Lani's interests in response to such barriers are the inclusion of culture and social presence to authentically, and meaningfully meet the needs of the learners in DE and ODL.

LANI'S INTEREST IN CULTURE AND HOW LEARNING HAPPENS IN NETWORKED ENVIRONMENTS

For learners to engage and remain in educational programs, it is essential they feel that they belong and are valued. If a program does not meet this need, it becomes a barrier to success for those students. Understanding this, Lani began to consider what it meant to have a culturally inclusive online learning community. After researching various definitions of culture and reviewing literature on existing frameworks for understanding culture, she considered what culture meant in an online environment; two themes emerged. The first was that cultures are complex. Examples of this, described in her 2021 keynote to faculty at Northern Kentucky Universities' Summer Online Faculty Institute, are how some cultures are less hierarchal, such as the United States, and others are more hierarchical, such as Mexico. Certain cultures, like the United States, value individualism, while others, like Japan, value collectivism. Lani discussed the concept of *uncertainty avoidance*, wherein certain cultures are very comfortable with a lot of ambiguity and certain cultures are not. She used the United States as an example of a culture that is very schedule-oriented, while Morocco, for example, is not. In connection to value systems, she stated that certain cultures are masculine, such as Mexico, while others are considered feminine, like Sweden. The second theme that is situated within the complexity of culture is the understanding that culture is multi-layered. Such multi-complexity is seen when considering how viewing a national culture is challenging, as it "doesn't really describe all the people in it" (Gunawardena, 2021). The individualism of the learner must also be attended to in order to deliver equitable education. Lani's example is the struggle of female students in male-dominated industries, such as engineering, where course design often suits many, but not all of its learners, such as women (Gunawardena, 2021).

To address the complexity of culture and the individualism of the learner in DE and ODL, Lani pivoted her focus to researching how to develop a conducive social environment for distance learning. In her interview with Bainbridge and Wark (2023), she discussed how education is a social process, yet sometimes we forget the social aspect of learning when we use technology. Questions also emerged on how culture influences the learning process, which led to her work on social presence that was influenced by the work of Fine (1979) who coined the term, *idioculture*. According to Fine, *idioculture* respecifies the content of culture by focusing on the level of small groups and the social interactions therein. It makes the culture concept useful by focusing on empirically observable group interactions as the locus of cultural creation (iresearchnet.com, n.d.). In response to discussion on the emerging topic of communication and instructional technology, Dikkers et. al use Gunawardena and Zittle's (1997) definition of *social presence* as "the degree to which a person is perceived as 'real' in computer-mediated communication (CMC)" (Dikkers et al., 2017, p. 11).

Lani understood the importance of emotion and connectedness for learners, not only for an enhanced online education experience, but also to address equity concerns and the marginalization of some learners. Her work in social presence led to the understanding that it is a strong predictor of student satisfaction in CMC, which fostered the development of frameworks to guide future research and provide context and structure. One of Lani's earlier frameworks was the Social Presence Indicators, a collection of 17 five-point semantic differential scales and the GlobalEd Questionnaire (Dikkers et. al., 2017, p. 17). Lani's research led to improved pedagogical techniques for teaching online and blended courses.

Lani was also interested in how learning happens in networked learning environments and how educators know that students learn from the interactions that they have with each other (Bainbridge & Wark, 2023). These interests led her to become involved in researching the social construction of knowledge and, with colleagues Lowe and Anderson, developed the interaction analysis model (IAM; Gunawardena et al., 1997). The IAM is still one of the most frequently used instruments in the study of knowledge construction. The extent of its use makes it one of the most coherent and empirically validated instruments in the research field (Lucas et al., 2013). In addition to her research on the social construction of knowledge, Lani has extensively researched the IAM; how to understand interactions online, as well as the combination of social learning analytics and social network analysis needed to do so (Bainbridge & Wark, 2023). Her keen interest in intercultural communication pushed her to co-author the 2018 book, *Culturally Inclusive Instructional Design: A Framework and Guide to Building Online Wisdom Communities*.

LANI AND CULTURALLY INCLUSIVE INSTRUCTIONAL DESIGN

The two greatest challenges facing us are clashes resulting from different cultural perspectives and the need to acquire wisdom to deal effectively with the environmental challenges created by 8 billion humans living together on this planet. This book speaks directly to both of these challenges (Anderson, 2018, as cited in Routledge.com Reviews).

In 2018, Lani and co-authors, Casey Frechette and Ludmila Layne, wrote the book *Culturally Inclusive Instructional Design: A Framework and Guide to Building Online Wisdom Communities*. It won the 2019 Outstanding Book Award from AECT's Division of Distance Education. As Lani's dream of increased access to education became a reality through her efforts—and the efforts of others—in DE and ODL, her attention turned towards the intersection of culture and instructional design. "Culturally inclusive instructional design provides a framework for thinking about culture in digital learning, offering insight into how to build inclusive online communities that encourage reflection and growth, regardless of content domain" (Routledge.com, 2019, para. 1). The "WisCom" framework

looks at learners' collaboration in real-world problems. There are seven components to guide the design, delivery, and assessment of instruction with wisdom at the center and transformative learning at the end, achieved through the process of working together in collaboration with each other (Gunawardena, 2021). For Lani, the underlying premise of WisCom is that, if students from diverse backgrounds can feel connected, they can produce amazing learning experiences, which is often very difficult to do (Bainbridge & Wark, 2023).

ACCOLADES AND PROUD MOMENTS FOR LANI

Dr. Gunawardena's publication record in DE and ODL spans over 30 years, with over 125 publications to her credit, including two books, as well as book chapters, articles, forwards, and book reviews. In addition, she has been a participant in many interviews, conference proceedings, evaluation and technical reports, magazine articles, and as a keynote speaker (Gunawardena, n.d.; University of New Mexico, n.d.). For example, Lani has:

- **1988:** Co-evaluated the State of Oklahoma's interactive television-based distance education system
- **2010:** Appointed by the United States Secretary of Defense to serve on the Army Education Advisory Committee - Defense Language Institute Foreign Language Center Board of Visitors Subcommittee to evaluate the curriculum and the institution's support system for language learning
- **2018:** Led and completed the External Program Review effort and self-study report for the OILS program
- **2019:** Appointed as a World Bank consultant for the Ministry of Health in Sri Lanka to design, develop, and evaluate online professional development programs for primary care physicians
- Directed distance education evaluations for the United States Department of Education
- Directed distance education evaluations for the National Institutes of Health funded Native American Research Center for Health
- Consulted for the World Bank, the Asian Development Bank, U.S. corporations, and international higher education institutions in Brazil, Ghana, Mexico, Spain, Sri Lanka, and Turkey (University of New Mexico, n.d.)

Dr. Gunawardena has won several awards in her career, including:

- University of New Mexico's General Library Faculty Recognition Award for outstanding work as a College of Education faculty member.
- University of New Mexico Regents' Lecturership and Regents' Professorship.
- Charles A. Wedemeyer Award for Excellence in Book-length Manuscripts in the field of Distance Education.
- Fulbright Regional Research award to conduct research in Morocco and her native country Sri Lanka.
- **2019:** Outstanding Book Award from AECT's Division of Distance Education (University of New Mexico, n.d.)

In her interview with Bainbridge and Wark (2023), Lani discussed proud moments of her career. She said,

The first accomplishment is my contributions to research in the fields of distance and online learning. [This includes] some of my early work on the social construction of knowledge, and the development of [AIM].

...Another area of research where I have made a contribution is my studies on social presence.... The scale we developed in 1997 in the article I co-authored with Zittle to assess social presence through online surveys is still being used by researchers. I'm glad that my social presence research really did have an impact.

...My research on how cultural factors influence communication and learning online is the third area where I have made an impact.

...my design work...Our book, *Culturally-inclusive instructional design: A framework for building online WISDOM communities*, and the companion website www.colectivo.io, where we want to develop an international community of instructional designers, who share their designs that support cultural inclusivity.

...international projects...My students and I developed a mobile and e-learning solution for training physician assistants in Ghana." [From this project] "I learned a lot about how to negotiate cultural spaces online and cultural spaces in international projects.

...I have worked in my country of birth, Sri Lanka, as a consultant for the Asian Development Bank funded project called the, 'National Online Distance Education System,' housed within the Ministry of Education, where they were actually going to implement a national distance education online system.

...Currently, I am working as a World Bank consultant to the Ministry of Health in Sri Lanka, helping them to design and assess online training courses for primary care physicians. (Bainbridge & Wark, 2023, pp. 145-146)

CONCLUDING THOUGHTS

Charlotte (Lani) Nirmalani Gunawardena's research offers a roadmap of the growth in DE and ODL. Beginning with wanting to help people have access to higher education, her interests and research brought her from television as a medium of educational delivery in the 1980s to creating frameworks for increased equity in distance and online learning in 2018 for all learners. Her impact has been vast for many students as her work has spanned the globe. She continues to lead students and governments alike through advisory roles in the drive for improved systems of access, and inter-cultural communication and learning. "The future is about people collaborating with each other" (Gunawardena, 2014). As a woman pioneer in DE and ODL, and as a Sri Lankan, Lani offers this field a feminine and person of colour perspective that has prominently advanced online learning. "The ever-evolving field of online learning continues to be informed by the seminal research and institutional leadership of women" (Bainbridge & Wark, as cited in Routledge.com, 2023). To this day, Lani continues her work in her role as a Regents' Professor in the Organization, Information, and Learning Sciences program in the College of University Libraries and Learning Sciences at the University of New Mexico alongside her other current contributions to DE and ODL.

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