Still Gender Boundary? Exploring Woman University Technology Students’ Doing Gender and Doing Technology

Ya-Hsuan Wang

Abstract—This paper is based on empirical investigation on the historically gender inequality in the field of technology. The technology-gender gap and gendered technology still exist. Addressing the policy of gender mainstreaming, this paper focuses on the gender-technology relations by questioning the “technology as a masculine culture” and “technology as a male institution”. Based on the sociological and feminist approach, this paper explores how woman university technology students articulate the formation of gendered technology. It concludes that women co-constructed and deconstructed simultaneously the gendered-technology phenomenon. Their construction corresponds to the changing schooling and societal expectation outside the education and their deconstruction subtly reacts to Bem’s (1974) gender role theory.

Index Terms—Female experiences, femininity/masculinity, gender boundary, gendered technology, technology-learning.

I. INTRODUCTION

The gendered-technology phenomenon is still in place. Gender segregation has stabilized to an almost identical level in many countries and it is sustained by a number of structural developments in educational and occupational institutions [1]. There is also the gendered disciplinary culture without balanced gender models in university [2], [3].

Danielsson [4] explored Swedish woman university physics students’ experiences and found the masculine connotations of physics and the gender expectations on the female. The gendered-technology phenomenon discouraged the female from engaging in technology. Compared to men, women with a degree in a predominantly male field of study seem to be systematically disadvantaged in both Germany and Spain, particularly with respect to unemployment [5].

Taiwan is well-known as a kingdom of technology that reflected not only in the curriculum structure but also in the gender allocation of university subjects. Responding to emerging social issues such as gender mainstreaming and gender equality in the multicultural and e-society, the 2004 Gender Equality Education Reform operated within Taiwan’s particular socio-political context had corresponded to the revolution of gender structure in the field of technology and science. This research project focuses on the gender-technology relations. It questions the “technology as a masculine culture” and “technology as a male institution”. This project aims to explore the contemporary discourse of gender boundary and gender mobility in technology, drawing the girl discourses on technology, gender, and success.

Addressing the policy of gender mainstreaming since 1985, many countries have practiced Gender Equality Education in schools. Hence, more female technologists are working in universities; there are getting more women studying technology in universities. However, empirical study [6] points that successful female technologists have to move beyond culture barriers and obtain more support than men—e.g. maternal support, institutional support and social supports such as seeking male role models and identifying with male roles.

According to my previous research [7], female technologists in Taiwan are still rather corresponding to the patriarchic society than challenging gender inequality. They indeed have advantages in successfully demonstrating both femininity and masculinity more naturally than males. While they succeed in technology, they experience simultaneously failure in female identity. Gender mobility is seen in those who survive in the social structure of strict gender boundary. The gender discourses of woman technologists in Taiwan’s universities reflect a masculine technology which intensifies masculinity yet mitigates femininity.

Followed by the above study, this research focuses on the woman university technology students’ doing gender and doing technology. It is to concern if they were aware of gender equality or were they just corresponding to the patriarchic society? It is significant to understand how elite women break the gender boundary and how they could create gender mobility. It is dealt with gender performance about technology learning. This paper aims to analyze the gender-technology discourse of women into technology and explore female success to the gender-technology relation and gender identity (femininity/masculinity).

II. LITERATURE REVIEW

According to the survey by Department of Statistics [8] in Taiwan, there is gender gap between technology and humanities in university subjects—Technology in university M/F: 68.35%/31.65%; Humanities in university M/F: 31.14%/68.86%; Social Sciences in university M/F: 37.48%/62.52%. The above gender analysis on the university subjects shows that the gender gap in technology is not closing up at all.

Concerned with this gendered phenomenon, Brickhouse [9]...
provides two different interpretations. The deficit model stereotyped with women who are less able to the abilities of space and abstract reasoning. It is an interpretation based by gender discrimination. The inferior treatment model assumed women with higher academic achievement but lower involvement in technology. It meant men are more interested in technology and science than women. So, why is technology gendered? It is because women choose to stay in the division of non-technology and humanities.

However, the above interpretations ignore the unequal structure in society. Gender differentiation is socially constructed. It is mostly a sort of dualism: McDowell [10] divided male/female features in the book *Gender, Identity and Place*. Male dominates the public sphere with the features of work, production, independency, power and being outside; while female belongs to the private sphere with the features of family, consumption, and dependency, being powerless and inside. The traditional gender role expectation of men is masculine, reason, active and strong, yet women for feminine, emotion, passive and weak. This dualism of gender differentiation forms the gender regime in society [11].

The power relation between men and women determines the division of labor. Gender is the basic principal of social relation. Gender shapes the conditions of human life including the allocation of power and privilege, the formation of consciousness and system. As Smyth [12] concludes, gender continues to have a strong direct effect on labor market outcomes in both track-differentiated and general educational systems. The stratification of school organization through the differentiation of men-strong/women-weak was produced and reproduced from generation to generation.

Although many research argue that gender polarization continues to work throughout the segregation of educational work [13], other research found the insufficient categorization of dual gender role theory. Blackmore [14] argues a new type of gender differentiation: teachers’ work often links with their masculinity/femininity. In most schools, reason is associated with men and school administration, while emotion is equalized to female feature and teaching. Bem [15] proposes four types of gender characteristics: masculinity, femininity, androgynous, and undifferentiated. Androgyious challenges the dual gender discourse.

Above all, this study concerning gender regime examines how the elite women articulate the gendered-technology phenomenon and how their performance of femininity/masculinity reacts to Bem’s theory.

### III. METHODOLOGY

A feminist approach was selected for this study in order to uncover the rich details and in-depth descriptions of the female experiences. Individual interviews were conducted on 16 selected elite women (female university students majoring in technology). They were based on five top universities in Taiwan, namely *National Taiwan University, National Cheng Kung University, National Chiao Tung University, National Tsing Hua University, National Taiwan University of Science and Technology, and National Chung Cheng University*. All the interviewees were from a portion of the diverse ethnic backgrounds represented in the mainstream of Taiwan—most Fukkien Taiwanese, some Chinese, and few Hakka Taiwanese.

As shown in TABLE I, the female students ranged in age from twenty to twenty-five. Half of them are undergraduate students and half are graduates. They are currently studying on technology-relevant subjects such as *Mechanical Engineering, Electrical Engineering, Materials Engineering, Electronics Engineering, Communications Engineering, Aeronautics and Astronautics Engineering, and Healthcare Information Management*.

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A review of the literature in preparation for the development of the interview guide disclosed interesting questions from previous studies on gender-technology relations and women’s issues. An interview guide was created consisting of four aspects throughout their life courses—individual, home, school, and society. An in-depth interview process was selected as the means of gathering relevant information and developing conceptual categories about their life experiences of doing technology, doing gender and performing femininity or/and masculinity. Interviewing items were focused on the following questions:

1. your experiences of technology-learning and its dilemma, motivation and social model
2. you perception on yourselves (successful self) in terms of doing technology
3. how much do you depend on your femininity or masculinity toward success.
4. how do you make use, transform, or discard your femininity during their career in technology
5. how do you interpret gender boundary or gender mobility as well as mapping the gendered culture in SECT.

Interviews were conducted individually with a brief description of the purpose of the research project and background of the researcher. This study is part of a two-year project funded by National Science Council in Taiwan. The first year targets the female technologist in university and the second year targets the female technology students in university. In most cases, all the participants were willing and enjoyable. Each interview was done during 1.5~2 hours. The interview process took over fourteen months. All interviews were taped and transcribed. A system of field notes, diary notes, analytic memos and transcripts was established. Through writing diary notes and analytic memos, themes began to build and the common patterns were formed by multiple interpreters.
IV. FINDINGS AND DISCUSSION

Based on the 16 qualitative interviews, this research categorized the contextual data into four aspects of their technology-learning experiences: individual, home, school and society.

A. Growing Masculinity

When women enter their first year at university, they figure out easily the masculine culture in their Department. Based on participants’ stories, the woman university technology students perform masculinity more than femininity, as Yinwen said:

“It’s obviously that the girls in our Department are not girly at all…we are even manly. You can distinguish us from those girls in Humanities. We are all in jeans, T-shirt, yet they are in a piece, heels, with an umbrella, with all sorts of decoration and most importantly, they make up. (Yinwen, 23 years old, graduate student, Department of Aeronautics and Astronautics Engineering)

Immersing in such a masculine environment, the woman university technology students were not born masculine but becoming masculine. The individual femininity was influenced by the disciplinary culture of Engineering, gradually transforming into masculinity, as Huihsuan said:

“I become more robust and strict as long as I study in this subject. I was so shy in childhood. However, my college classmates judge me a strong woman. They see a very firm and masculine temperature in me. Therefore, I think, doing technology is somehow redoing gender (Huihsuan, 20 years old, undergraduate student, Department of Electrical Engineering)

Interestingly, most of them have some characteristics in common: preferring thinking and understanding to memorizing or recitation; preferring reading natural scientific mystery books to romantic fictions. Although mostly they identify with male role models and adorn masculinity, they couldn’t escape from the anxiety of being ‘strong woman’. There is stigma on strong women. If a woman makes it to the top of a corporate ladder, she is almost always seen as a shrew. Besides, the elite women also maintain the gender stereotype of gendered technology as there is found a myth that women are inferior to men in technology.

B. Family Support

According to their family data, the female students grew up in a high socio-economic status family. They were supported from their parents by providing good education, gendered toys, cultural capital, and high educational expectation. Most of them somehow identify with male role models in family. For example, some of their uncles or fathers are engineers, medical doctors or professors. Male playmates play an important role in inspiring the interest of exploration, as Pinhsing said:

“I like trying anything new. I like to do things by my hands. My childhood was full of fantastic adventures together with my older male cousins. I prefer man’s games. I often follow my brothers for playing balls, computer games, toy cars, toy building blocks, or even fighting against each other. My playmates around me are all male, and I enjoy that. (Pinhsing, 22 years old, undergraduate student, Department of Electrical Engineering)

Regarding their parental support, gender-free family climate is also a key to develop girls’ potentiality in technology. Most girls were growing up in an open environment without gender differentiation. Some parents even treat their daughter as a son, as Huana said:

“My father is a SECT professor. He works for technical production for marketing. My uncle works in medicine. He is very good at medicine improvement. I have two younger brothers, but my parents have quite high expectation in me, probably inspired by my uncle’s achievement. They don’t treat me differently from my brothers. I’d say they somehow dominate the way which I stand now (Huana, 24 years old, graduate student, Department of Communications Engineering)

Although parents provide a good family background for them, they are conscious of the dilemma of being a woman: “we eventually shall face the struggle between career and family in the future”.

C. Single-Sex School with Masculine Schooling

The female takes advantages in studying in single-sex schools as well as the gifted classes. Ten of the 16 selected woman university technology students were from single-sex high school. In a classroom full of female students, they experienced a zero-stereotype learning environment where they were demanded for good scientific performance, as Shiching said:

“I have been studying in the gifted class since primary school. I had more opportunities for the competition of natural science or technology. I had to learn to do experiments on my own since I was eight. Following this track, I have no other choice but SECT; particularly studying in a single-sex school we have no male classmates to rely on. We have to be a man independently (Shiching, 21 years old, undergraduate student, Department of Mechanical Engineering)

Moreover, thanks to the single-sex school and the gifted class, these girls fortunately have female role models in SECT. Many of them were encouraged or inspired by their female teachers of physics in schools or university. However, in most cases, teachers’ gender discrimination is the worst harm to them. As soon as they enter in university, most professors convey more or less gender discrimination such as beauty sigma and labeling of weakness, as Peiyu said:

“Some said women in technology have privileges. My male classmates judged that girls get higher score in exams thanks to being female. Some male professors question female students with simple items in avoidance of wrong answers. They actually discriminated girls. Maybe, maybe the male professors were just like grandpas who favor granddaughters. Teachers like us because we behave better than men (Peiyu, 22 years old, undergraduate student, Department of Materials Engineering)

Most woman university technology students perceived the
gender discrimination from the male. Therefore, they have to crash the stigma of beauty, detach the weakness-label, and move beyond the Pygmalion effect from teachers. In a word, education to women is a duality which enables girls for learning technology but also constrains girls against involving technology.

D. Liberal Feminism Society

What is the gender impact of the society on the individuals? Based on the oral historical data, woman university technology students have some positive experiences of being a woman. For example, recently more organizations in SECT desire gender equality. In this circumstance, women majoring in technology are much more welcome than men.

As far as I knew, some companies claiming gender equality would recruit female technologists than male. With this trend, women in technology are welcome than ever. Now that most members in this company are male, why not recruit female? Women can take a balance of the masculine culture in SECT. It’s an advantage for me (Chiaching, 22 years old, graduate student, Department of Electronics Engineering)

Technology does not only desire gender equality, but also desires women in order to develop female technologies. Therefore, within such a liberal feminism society, woman university technology students perceive that the traditional gender stereotype on strong women has been transformed into gender reaffirmation. However, Taiwan is rooted in the patriarchy society in which gender continues to have a strong direct effect on employment and family. As Yichi said, female achievement cannot be seen as her own success:

Women are like working in a fishbowl. If we succeed, others criticize our success came from our beauty. If we fail, others justify female inferiority. Even in university our professors make me hate my gender. When my ability in SECT was well presented, my university teachers appreciate my effort rather than my potentiality. It seems to them my success is temporary because I work very hard. I was never recognized by my SECT talent. He even then said to me, “how come you beat your male classmates!” I then asked myself, shouldn’t I beat men? (Yichi, 22 years old, undergraduate student, Department of Healthcare Information Management)

In society, there are numerous obstructs against female technologists: women with a sense of alienation due to gender distances from men have less female models in SECT; women often threatened by dirty sex jokes could be disadvantaged by gender division of labor in SECT; women have dilemma between career and family. Most importantly, women themselves have the self-doubt syndrome because they don’t believe their gender as others do.

As a whole, the assistances and obstruct of women doing technology is summarized in Fig 1.

In order to bring into further academic discussions, this paper explores three discursive themes on technology discourse, gender discourse, and professional authority.

In terms of technology discourse, the elite women were not conscious of technology as a masculine field, though the discourse of “men good at technology” was found in their narration. It shows that the elite women’ epistemology on technological knowledge is a biological perspective; that is, men are born for technology. Nevertheless, as McNeil [17] notes, we should question the taken-for-granted assumption of man/masculinity linking with technology knowledge. The elite women interpret technology with man’s words. We found that recently women are apparently included in the field of technology more than ever but they perform more masculinity than femininity.

According to the oral interview data collected in this study, I demonstrate the differentiation of masculinity/femininity in gender discourses and professional authority in Fig. 2.

In terms of gender discourse, the left side of Fig. 2 shows...
that the discourse of strong-woman stigma was linked with masculinity, yet the discourse of female technologist was linked with femininity. However, the elite women maintain some androgynous in terms of gender discourse. It means that the discourses of female-technologist nomination and strong-woman predication are no longer bother the younger generation. The boundary between masculinity and femininity for the younger generation is getting blurred. They also benefit from the need for developing female technology in current market. The above findings show that the female disadvantage in the invisible culture of gendered technology is mitigated.

In terms of professional authority of gender hierarchy, the woman university technology students address masculine personality for high authority in terms of professional authority. Therefore most masculine teachers were considered with higher professional authority. It corresponds to its gender discourse of strong women perform masculinity more than femininity. This result explicates an alternative pattern of gender hierarchy that masculinity is superior to femininity. It is somehow corresponding to Vaerting’s [18] research that those who perform masculinity become the dominant sex, yet that performs femininity is subordinate. Therefore most masculine teachers were considered with higher professional authority. It corresponds to the stage of success?

In conclusion, the researched women in this study somehow break gender boundary by GIST based on their individual chrematistics, personal interest, family support, and school empowerment from which they have gained power in the field of technology. Gender mobility is seen in the elite women who survive in the social structure of loose gender boundary. Femininity is more welcome in the daily life of elite women than before. Responding to the changing economy, there are more market needs for female technology instead of male technology. It seems that technological women have promising future. It is worth of thinking further that what the elite women’s future would be? Would the female be as advantageous in the future society as the campus where they were? Can GIST genuinely break gender inequality? GIST can be sort of gender discrimination as those who work in society. It seems to them that university provides friendly climate for learning technology and getting along with males.

In the current universities, masculinity is no longer penetrated the technological fields through gender discourse and authority structure. Nevertheless, elite women are still under the protection of educational umbrella. They might not experience the social exclusion by gender in many aspects, especially in the academic seminars or workforce, where the male best perform their masculinity. Shall women, as Weinstein [20] relating femininity to an empty space and silent object, become man (masculine) in order to get access to the stage of success?

It is worth to mention that the stigmatized woman for female technologist is a trap door [21] that could crackdown female mobility to technology. As we all know, the patriarchic gendered structure can reproduce its corresponding gender ideology that male is superior to women in the public field of technology as well as in the wider society [22].

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Prior to teaching in university, she had 7 years teaching experiences in primary school. She is also an adjunct associate professor of the Centre for Teacher Education at National Chung Cheng University. She just completed two 2-year NSC research projects: Gender boundary and gender mobility in technology; Contextual analysis of issues in curriculum policy formation and implementation. She is recently involved with a 3-year NSC research project: “Becoming multicultural science teachers: Constructing MSE instruction/curriculum/networks and MSL scale/guide”. Dr. Wang currently serves as the advisors of Committee of Women’s Right Promotion and Gender Equality Committee. She is a frequent educational speaker, presents papers internationally and is widely published in academic and professional journals in Chinese and English. Her PhD thesis was awarded the best thesis by the Association for Curriculum and Instruction in Taiwan.