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Women and Men in Computer Science: Geeky Proclivities, College Rank, and Gender in Korea

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Abstract The underrepresentation of women in computer science (CS) is an extensively reported phenomenon. The institutional culture of "geek" masculinity has been recognized as one of the important factors in explaining women's avoidance of CS in Western contexts. We conducted a survey and in-depth interviews to examine how Korean CS majors interpret their departmental culture and form a sense of belonging. To summarize our findings, Korean students' identification of themselves with geekiness was associated with university prestige more frequently than with gender. The geek identities and practices often associated with masculinity in Western contexts are related to university prestige in Korea. We do not argue that gender is irrelevant in

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constructing students' practices and identities in CS. Instead, we argue that it is important to analyze how gender appears more or less noticeably in the discursive construction of CS professional identities depending on contexts. This study calls for more careful attention to the processes through which the constructed symbolic hierarchies of geek over nongeek are mediated by unequal structures, including but not limited to gender, in CS. Our findings suggest that gendering in and of CS is more complicated than the dichotomy of male-technical versus female-social stereotypes.

Keywords gender inclusion in engineering · computer science · educational stratification · engineering identity · gender identity

Abstract 컴퓨터과학에서 여성의 과소 대표는 광범위하게 보고된 현상이다. '기크(geek)' 남성성이 지배하는 컴퓨터과학의 제도적 문화는 그동안 서구의 맥락에서 여성이 컴퓨터과학을 기피하는 원인을 설명하는 주요한 요소 중 하나로 인식되었다. 본 연구는 설문 조사와 심층 인터뷰를 통해 한국의 컴퓨터과학 전공자들이 어떻게 자신의 학과 문화를 해석하고 소속감을 갖게 되는지를 살펴 보았다. 연구 결과를 요약하면 한국의 대학생들이 기크와 자신을 동일시하는 정도는 젠더보다도 대학의 명성과 자주 관련되는 것으로 나타났다. 그동안 서구의 선행 연구에서 '남성성'과 관련된 것으로 보고되었던 기크 성향과 수행이, 한국에서는 대학의 명성과 유의미한 연관을 나타낸 것이다. 그러나 본 연구가 강조하는 바는, 그동안 알려진 바와 달리 젠더가 컴퓨터과학 전공 학생의 수행 또는 정체성 구성과 무관하다는 것이 아니다. 오히려 본 연구는 컴퓨터과학 전문가의 담론적 정체성 구성에서 젠더가 더 명백하거나 덜 명백한 것으로 발견되는 차이에 주목하여, 이 차이를 만들어내는 특수한 맥락—예컨대 한국의 대학간 위계—을 주요한 분석 지점으로서 지적한다. 다시 말해 본 연구는 기크 대 비기크 (non-geek) 사이에 구성된 상징적 위계가 불평등한 구조적 요인에 의해 매개되는 과정에서 컴퓨터과학 내부의 성비와 같은 젠더 불평등 이외에도 어떤 다른 요소가 교차적으로 작용할 수 있는지에 대해 더 주의 깊은 관심을 기울일 필요가 있음을 주장한다. 본 연구의 결과는 컴퓨터과학의 구성원 정체성과 조직 문화가 젠더와 상호작용하는 양상이, 서구의 공학자 정체성 연구가 비판적 분석의 대상으로 제시해왔던 기술적인 남성 대 사회적인 여성의 이분법보다 복잡함을 밝히고 있다.

Keywords 젠더 · 공학자 정체성 · 컴퓨터과학 · 대학

1 Gender Inclusion in Computer Science: For Whom and for What?

The underrepresentation of women in computer science (CS) is an extensively reported phenomenon worldwide. Male students in the United Kingdom dominate more than 80 percent of the undergraduate degrees in CS and 75 percent of the computer-related workforce. In the European Union, 19 percent of information and communication technology (ICT) managers are women, 19 percent of ICT entrepreneurs are women, and less than 30 percent of the ICT workforce is female (Advisory Committee on Equal Opportunities for Women and Men 2015). Encouraging more women to have careers in ICT-related industries is an important policy agenda in many states, particularly in Europe (Faulkner 2004; Rommes et al. 2004; Sørensen 2004; Vitores and Gil-Juarez 2016). At this point, we need to summarize repeated features in European

strategies of gender inclusion and assess whether such strategies will be effective in non-Western contexts in terms of generating more inclusive and socially responsible science and technology.

South Korea (hereafter Korea), one of the East Asian advanced economies and an emerging center of global ICT industries, provides a revealing case study in gender imbalance in CS. In 2013, Korean president Park Geun-Hye launched the new Ministry of Science, Information and Communication Technologies, and Future Planning (MSIP) and announced the "creative economy" as the government's core agenda. Before that, President Kim Dae Jung also announced the "knowledge economy" as the vision for Korea in 1998. Similar to the British policy promoting creative industries, the Korean creative economy or knowledge economy focuses on developing media and information technology (IT). For 2014, the ministry's budget increased to more than US$12 billion, with over US$2 billion going directly into fostering tech startups. The government's policy commitment to the knowledge-based economy has generated a discursive space in which skills in CS are considered a crucial resource for individuals to succeed in the globalized labor market and for the nation to raise its level competitiveness (Cunningham 2009; Lee 2016). Yet according to the government's *Report on Korean Women in Science, Engineering, and Technology* (Women in Science, Engineering, and Technology 2013), Korean women fill only 16.2 percent of professional ICT positions. Increasing the number and percentage of women who can be mobilized as human capital in the knowledge economy is becoming a priority for Korean policy makers.

Before looking into Korean variants of gender-inclusion strategies in CS, the following section explains the assumptions and implications related to gender-inclusion discourses in the West. We focus primarily on European and US discourses on the constructed affinity between the so-called geek masculinity and CS institutional culture. Then, Korean public discourses that encourage women to participate in the currently male-dominated knowledge economy are discussed. In short, the public discourse in Korea emphasizes fixing women, not fixing the institution. Women are encouraged to assimilate themselves into men's clubs in CS. We also note Korea's stratified university system contributing to students' fashioning and narration of selves as "masculine" subjects at highly ranked universities.

The next section discusses gender and university prestige as two variables associated with Korean students' geek proclivities, using data obtained from surveys and interviews. Finally, the article concludes by calling for more careful attention to local contexts where technical expertise and masculinity become socioculturally associated in ongoing attempts to recruit, retain, and empower more diverse forms of expertise in CS.

2 European Strategies of Gender Inclusion in CS

In Europe and the United States, integrating computing with more traditionally "feminine" topics such as biology or community issues was suggested as a way to attract more female students to CS (American Association of University Women 2000; Margolis and Fisher 2002; Lagesen 2007; Rubio et al. 2015). For example, linking CS education to "other arenas and people" such as "a CD database or a list of friends'

phone numbers" was suggested as a strategy to "spark and engage girls' interest and engagement in computing" (Margolis and Fisher 2002: 120). In Norway, advertising campaigns for CS departments were made "to change the image of computer science to become less technical ('masculine') and more relying on social skills ('feminine')" such as "communication skills, orientation toward users and empathy" (Lagesen 2007: 86, 77). Also, increasing the number of female faculty and providing female-female support networks have been recommended to the European Union as a way to provide a more welcoming learning environment for women in CS (Sørensen, Faulkner, and Rommes 2011). Perhaps one of the best-known examples of providing female-friendly learning environments in CS is Harvey Mudd College in the United States, which received much media attention. The university separated experienced and less experienced students so that less experienced ones were not intimated. Also, their programming courses had assignments such as "sound editing Darth Vader's voice" rather than focusing narrowly on "technical" subjects (Kaufman 2013).

The above-mentioned strategies to lessen gender imbalances were based on the assumption that the women's avoidance of CS is caused by the dominant institutional culture of CS, so-called geek masculinity (Anderson et al. 2008; Cooper 2000; Hacker 1990; Margolis and Fisher 2002; Kendall 1999; Varma 2007). Jane Margolis and Allan Fisher (2002: 113) stressed one of the reasons girls do not enroll in CS is that CS courses have "a geeky reputation" and "girls do not want to be associated with that image or with the people in the class." A *geek* is defined as "a person who is socially awkward and unpopular," "a usually intelligent person who does not fit in with other people," and/or "a person who is very interested in and knows a lot about a particular field or activity" (Merriam-Webster 2017). The word also refers to a person who passionately pursues activities related to technical subjects while being generally uninterested in social activities (Chou et al. 2011). Women's noted unwillingness to identify with geeks has driven discussion regarding how the CS institutional culture needs to be changed to recruit women (Margolis, Fisher, and Miller 2000; Abbiss 2009; Lasen 2010).

Previous studies on geek identities and women in CS focused on how geek behaviors are embodied by (more) men and not by (more) women. They discussed how geek culture—bragging about technical expertise, joking about CS-related topics, working long hours, focusing on abstract algorithms rather than applications, and so on—which is shared by some males in CS, has developed a so-called chilly climate where female students feel intimidated and excluded. Lori Kendall (2000) described young male participants in an online forum as enacting their masculinity through their social ineptitude and fascination with technology. Sherry Turkle (1984: 184), in her analysis of hackers' culture at MIT, noted that "the particular style of relating to technology," such as proclivities to take a strong, almost sensual pleasure in obtaining technical expertise and to consider programming as a way of life rather than an object of study, remains a mostly male lifestyle. The department of CS was observed as "a male world . . . peculiarly unfriendly towards women" (194).[1]

[1] Studies on geek identities and masculinity extend feminist technology studies. That literature has emphasized the historical and cultural processes associating masculine values with technology (Faulkner 2001; Lohan 2000; Wajcman 1991, 2000). For instance, in architectural engineering, hands-on practice for building design is associated with masculinity, while simultaneously it is considered to be an important and "real" part

It was in such contexts that "women-friendly," "gender-sensitive," or "social" curricula were introduced as strategies to integrate more women in CS. Despite some careful criticism that women-friendly CS curricula might reproduce rather than reformulate the binary association of the technical with men and the social with women, redefinition strategies have been widely applied in the Western contexts to increase women's recruitment and retention in CS (Varma 2007; Vitores and Gil-Juarez 2016).

3 Why Focus on Korea? Fixing Women, Not Stratification, in Higher Education

Being overly enthusiastic about technical mastery and absorbed in computing has long been associated with masculinity in Western contexts (Murray 1993; Faulkner 2007). Yet it is notable that in Korea technical mastery and extreme work hours have been associated not only with masculinity but also with national development (Han and Downey 2014). In such contexts, the public discourse on institutional culture in science, technology, engineering, and math (STEM) as having a chilly climate for women has been constricted. Eunkyoung Lee (2012) points out that, although Korean policies for supporting women scientists and engineers have become more concrete over time, they still remain in the category of cultivation and utilization of women for the nation's economic development through science and technology. Hye Young Park (2011) also argues that science and technology policies treat women as a high-quality human-resource supply while paying insufficient attention to the problem of gender inequality. The idea that science and engineering are fields of meritocracy is still influential. For example, one policy report on the utilization of female scientists, published in 1991, stated that, for a woman to become a professional scientist/engineer, she must have a "thorough professional consciousness, strong sense of responsibility, and pride as a scientist" (Y.-J. Park 1991). Although it is unfair to say Korean policies toward gender equality in science and technology have remained static since the 1990s, more recent studies also indicate that Korean professional society still emphasizes women's own efforts to achieve gender equality. Researchers in science and engineering share the awareness that competition is based on individual merit. While women scientists and engineers readily admit they have experienced gender discrimination, the way they solve such a problem tends to be oriented toward improving individuals' expertise rather than publicly addressing the structural issues of gender inequality (Chung 2016; Chu 2014).

Some public events in Korea even work to articulate the idea that women possess unique strengths to succeed in IT. The 2015 Women in Software Engineering Week in Korea was organized by MSIP and Google. The event was filled with addresses emphasizing women's unique strengths as IT professionals. Words such as *women's empathy*, *refined intuition*, *intense care*, and *sensibility* were used by invited speakers, including female professors and executives. "Surely, women as well as men can boast

of engineering. In contrast, communication with clients and project management are regarded as a supplementary, feminine, "social" part of engineering (Faulkner 2007). Thus, feminist technology studies provide a critical view of the processes through which technology is laden with dichotomously gendered symbols and how the mastery of certain technical skills such as computer programming becomes symbolically associated with masculinity.

their competence in IT and make achievements" was the opening remark made by the director of the IT & Future Strategy Agency (MSIP 2015). The same was true on Girls in ICT Day, organized by MSIP in 2013, when Hyeun-Suk Rhee, director of the UN Asian and Pacific Training Centre for Information and Communication Technology for Development, said, "Women's ingenuity, open-mindedness, meticulousness, and communication skills are all valuable resources in ICT" (Kang 2013). The catchphrase used for this event was "Girls, let flowers bloom in ICT" (Kang 2013). Hyeonju Kim, president of Korea IT Business Women's Association, in 2012 said in an interview, "IT is a perfect fit for women's meticulousness," while she advertised a supporting campaign for women in IT (Kim 2012).

What is invisible in such celebratory remarks on women's unique strength is the question of what structural barriers work against women, discouraging them from becoming such "valuable resources" in IT industries. Instead of structural causes, women themselves are singled out as the source of problem when the existing gender imbalance in IT is problematized in the public sphere. In 2014, Google Korea organized Women Engineers Night and invited Eunsuk Cho, managing director of LG Electronics mobile communications, a leading company in the Korean IT industry. While Cho pointed out "the problem of IT industry having less than 1% of women as directors," it was women engineers whom Cho urged to "break the stereotype and do not become such women who quit jobs after marriage or avoid overtime." She added her career advice: "If male seniors say 'don't come on Sundays,' or 'go home and don't work overtime,' you should be alert because that could mean 'you do not belong to our world.' You should have a male mentor and learn about the male world from him. It is unavoidable that you will work with more males if you are in the IT industry. Accept the reality and invest in your working relationship with men" (J. Park 2014). Such remarks assign the responsibility of gender inclusion to individual women. The issue of how women can see the feasibility and relevance of belonging to a male-dominated working environment is not addressed in terms of structural problems.

Thus, the public discourse in Korea puts more emphasis on fixing women, not fixing the institution. Women are encouraged to assimilate themselves into men's clubs in CS. Women need to change themselves, not occupational culture, to stop leaky pipelines in CS. It is easily observable that Korean women narrate their processes of career advancement in CS as those of distancing themselves from "other" women. For example, AhnLab, a leading security-software company in Korea, posted an interview article titled "What It's Like to Be in IT" on the company blog. Women developers made such statements as the following: "There are people who do not work overtime maybe because they set limits to how much they can do in a day. When we work overtime it is not because we are forced. We want to make something. We want to do it faster so we voluntarily work overtime. This is better than doing routine work" (Lee 2011). Here commitment to and enthusiasm for work are expressed as the necessary mind-sets that differentiate professionals from regular workers doing "routine" tasks.

Surely, some women trying to fix individual women instead of male-dominated institutional culture is not a Korean-specific phenomenon. Female engineers were noted to position themselves as nonfeminists who refuse to belong to marginalized women's groups (Jorgenson 2002). To fit in, women strategically choose to rationalize mistreatment on multiple levels and "do not make waves" (Hatmaker 2013; Tonso 2006; Powel, Bagilhole, and Dainty 2009). However, in Korea, especially after the

1997–2001 Asian debt crisis, rhetorical formulas such as the "new intellectual," "creative cultural capital," and the "human capital of youth" came to be used popularly and evoked an imaginary distinction between "productive," "employable," "deserving" subjects and "good for nothing" ones in global economies (Song 2007). In such a social milieu, the computer-geek identity gains currency as being emblematic of power and appeal in the market-driven society, with its competitiveness, penchant for hard work, and savvy entrepreneurship. Geeky traits such as commitment to—to a degree of obsession with—technical mastery are likely to be highly appreciated regardless of gender. Though poor social skills are not socially valorized, geek subjectivities sometimes denote power and appeal as they embody both the traditionally masculine virtue of being talented, capable, and driven and the twenty-first-century worldly ideal of professional achievement and entrepreneurship (Varma 2007).

As influential figures in Korea produce accounts that women should take on individual responsibilities for intense commitment to advance in CS, Korean women in CS learn to present themselves as hardworking and men-friendly professionals. Moreover, they distance themselves from subjects who do not or cannot seek pleasure from technical work—women who "go home and don't work overtime." At this point it becomes important to investigate what kinds of women (and men) *could* embody the society's expectation that they *should* be committed to technical work with pleasure.

Studies on the relationship between gender and technology in diverse cultural contexts have challenged the binary understanding of technical men versus social women. Within the subject of CS, a more diverse relationship between femininity and technology has been discussed along with the historical and cultural contexts of India, Malaysia, the Philippines, and Vietnam (Kelkar, Shrestha, and Vena 2005; Lagesen 2007, 2016; Mellström 2009; Ng and Mitter 2005; Saloma-Akpedonu 2005; Wajcman and Le 2007). The case of Malaysian CS and women is particularly informative in our following discussion on how gender in relation to occupational culture in CS appears in various forms.

The Malaysian state promotes the Malay race against Chinese and Indians in its efforts to build a fully developed country, or the so-called knowledge society. Occasionally, Malay women are promoted as agents of national development and modernization even over Malay men. For example, former prime minister Mahatmir Mohammad stated in an interview that Malay women are qualified for coveted jobs in the government as they major in "serious subjects" such as engineering while "boys are studying simple subjects which they think they can pass, such as Bahasa Malaysia, Islamic Studies and Social Sciences" (Mellström 2009: 897). Here at the intersection of gender and race, Malay—not Chinese nor Indian—women are interpolated as the container of "technical," "serious," "not social," "not simple" subjectivities. Interestingly, traditional men, who are blamed for their lack of mind-sets for the knowledge society, globalization, and high-tech economy, are metaphorized as "effeminate" subjects by public discourse—traditional men are not man enough to cope with modernizing Malaysia. Ulf Mellström's (2009) research reveals the processes through which technology works as the medium of power (re)construction while producing class cleavages within the female (and male) labor force, rather than a dichotomy between technical men and social women. Vivian Lagesen's (2008) research on Malay women's inclusion in CS also adds nuance to such a simple dichotomy. While CS is not perceived as a masculine subject in Malaysia, gender produces a uniquely feminine

experience in Malaysia as women are encouraged to major in CS to get good jobs and sustain their family's finances.

While Korea is increasingly becoming a multiethnic society, racial inequality in higher technical education and industry is not yet recognized as a social problem. Instead, what is often problematized in regard to Korean social inequality are the so-called old school ties (Lee and Kang 2015) or institutional stratification in higher education. Korea has a stratified higher education system, which is characterized by the clear hierarchical ranking of schools (Kim 2011). Students seek "school ties" (21.8%) and better chances for employment (34.3%) through college education (Choi 2015). Quantitative research demonstrates the relationship between university prestige, which is largely reflected by the average minimum score achieved by its applicants on a standardized entrance examination and college graduates' early labor-market destinations (Lee and Brinton 1996). Qualitative research has shown that university prestige, along with gender, heavily affects Korean students' self-understanding and articulation of how they develop their human capital (Abelmann, Park, and Kim 2009). Nancy Abelmann, So Jin Park, and Hyunhee Kim (2009) reported that both male and female students at highly ranked Korean universities expressed their willingness to go through constant self-management and self-improvement in order to fit in a global market. Notably, students' accounts of their university prestige, opportunities to "go global," and chances of successful self-development were sometimes coded with gendered perceptions of subjectivities and places. While elite universities and masculine accoutrements such as harsh self-discipline tend to be articulated as assets for advancing on the world stage, such feminine proclivities as empathy and kindness and nonelite universities are associated with the domestic sphere. The nation's stratified higher education and gendered narratives of social mobility mutually constitute each other.

In the following two sections, we report our findings from surveys and interviews and discuss class cleavages within female and male students regarding their identification with geeky behaviors and mind-sets. Inspired by Abelmann, Park, and Kim's research, we also examined whether and how university prestige is associated with Korean students' tendencies to relate to geek proclivities. Our findings are interpreted within the Korean contexts discussed thus far, where the appeal of technology and masculinity is socially crafted.

4 Data and Methods

The goals of our surveys and interviews were to observe and examine Korean CS majors' behaviors and mind-sets as geeky or nongeeky students. A literature review of geek behavior provided a foundation for designing survey questionnaires. Previous studies on CS and gender noted the following characteristics as geeky behaviors:

1. There are higher tendencies among male "geeks" to pursue learning outside of classes (Margolis and Fisher 2002). Intense "playing" with computers outside the formal educational curriculum and the independent pursuit of technical mastery, control, and virtuosity have been typically associated with male behaviors

in "all-boy clubhouses" in Western contexts (Turkle 1984; Dunbar-Hester 2008; Pollack 2015).

2. Geeks share the pleasure of informal learning with colleagues (Kleif and Faulkner 2003). In informal learning outside of classes, personal endeavors and independent study are often deemed to be important. What also comprises such independent CS learning, although it might at first seem ironic, is close interaction with peers. Unlike people's image of geeks as lone wolves, peers provide assistance and motivation to one another in learning-by-doing processes by swapping questions, information, and recognition (Margolis and Fisher 2002).
3. Geeky male students' reasons for studying CS are more closely linked to intrinsic values such as having fun with coding, while female and minorities students tend to state they study CS because of extrinsic values such as employment opportunities (Margolis and Fisher 2002; Papastergiou 2008; Varma and LaFever 2006; Varma 2007).
4. Geeks who find inherent fun in computing build up more confidence and interest in the college years. On the other hand, women and minorities who could not integrate themselves into geek culture lose their interest in computing and their confidence in being able to succeed at it (Margolis and Fisher 2002; Varma 2007).
5. Geeks, although they value and seek peer-based learning, lack socialization skills in general. They are perceived as "socially challenged students" who "sleep, code, sleep," regardless of the validity of such stereotypes (Margolis and Fisher 2002; Chou et al. 2011).

We made a total of seventy-eight statements that describe geeky proclivities based on the above five categories of characteristics.[4] We asked respondents how much they agree with such statements. By so doing, we addressed the following research questions:

1. Does gender affect college students' tendencies to embody geeky behaviors and mind-sets, summarized as intrinsic motivation to study CS, willingness to pursue intense technical learning through independent training outside of classes, valuing peer interactions for learning, and remaining confident and interested in CS?
2. Does university prestige affect college students' tendencies to embody geeky behaviors and mind-sets?

For this study, we used the paper-and-pencil survey method and collected data from students taking major courses in CS at four universities in central, southeastern, and southwestern Korea. We ranked respondents' universities as top tier or midtier based on the average minimum score achieved by the universities' applicants in a standardized entrance examination. Two top-tier universities were selected from the top ten, and two midtier universities were chosen from the top thirty to fifty colleges.[5]

[4] We also conducted thirty-six preliminary interviews with twenty-three men and thirteen women in Korean CS departments and IT companies to see whether Korean CS majors talk about geek traits similarly as discussed in (mainly) Western literature. Our interviewees frequently mentioned these five traits as traits of technically oriented CS majors.

[5] According to the 2015 survey, there are 189 four-year colleges in Korea. Although the exact average examination score for each university entrance exam is not available, the estimated minimum score for each

Table 1 Respondent gender by college rank [frequency (percent)]

College rank	Men	Women	Total
Top-tier	74 (80.4%)	18 (19.6%)	92 (100.0%)
Mid-tier	58 (60.4%)	38 (39.6%)	96 (100.0%)
Total	132 (70.2%)	56 (29.8%)	188 (100.0%)

The total number of CS students at the four universities at the time of the survey was 1,622, among which 398 were at top-tier and 1,224 were at midtier universities. We handed out our survey to all the CS majors taking required major courses at their universities. A total of 188 surveys were collected. Although our sample was not randomly selected, the sample size was large enough to draw significant conclusions (11.6 percent of the population). Distribution of gender by university tier is detailed in table 1. A chi-square test for independence indicates a p-value of 0.003, which enables us to conclude that there is no relationship between gender and college rank. In other words, when only college rank is associated with differences in students' average score, the association is not explained by gender, and vice versa.

All anonymous respondents were instructed to express their degree of agreement with the survey statements using a five-point Likert scale: strongly agree, agree, neutral, disagree, and strongly disagree. Of all the responding students, 92 were students at top-tier universities and 96 were at midtier universities; 132 were male and 56 were female (one respondent did not check gender). We used t-Tests to compare scores between gender and the college groups, excluding nonanswering respondents. Of the survey results, we identified fourteen statements in five categories where students' average scores differed by gender or university prestige.

When both gender and university prestige affected students' tendencies to identify with geek, we used analysis of covariance (ANCOVA) to confirm whether differences between college groups remain after controlling for the effect of gender on scores. The ANCOVA tests whether the independent variable (e.g., college rank) influences the dependent variable (e.g., the respondents' levels of agreement) after the influence of the covariate (e.g., gender) has been removed. Assumptions of normality and homoscedasticity were checked using Kolmogorov-Smirnov and Bartlett tests, respectively. Inspection of normal probability plots and residuals suggested that the data conformed to the assumptions of homoscedasticity and normality required for ANCOVA ($p < 0.05$).

In addition to the survey, we conducted in-depth interviews to further examine how Korean CS majors narrated their study habits, what they value as they try to belong to the department, and how they understand their departmental culture in relation to their job prospects. From June 2014 to July 2015, we conducted semistructured interviews with nineteen students—eleven women and eight men, twelve from top-tier and seven from midtier universities. We asked how interviewees came to major in CS, what kind of experiences make them feel confident and/or interested in CS, what makes them feel

department in each university is published every year by private education companies, which gives us the estimation of university prestige.

motivated or frustrated, and how they prepare for a job search. As our main goal is not to elucidate whether or how the Western geek culture or the term *geek* itself is interpreted and reproduced in Korea, we did not directly ask whether interviewees experienced geek culture as a source of gender imbalance in Korean CS. We were more interested in the sensitive topics of how some Koreans persisting in CS could still feel excluded because they do not see themselves as ideal students in the department, and how such recognition of who belongs and who does not is coded with power-laden and gendered narratives. Yet as our interviewees narrated their experiences in CS and described what kinds of students are recognized as ideal, the aforementioned five types of geeky behaviors were frequently mentioned, with some modifications. It was through the loosely defined concept of "geek" that we were able to translate our interviewers' narration of how they made sense of belonging in CS. In this sense, the term *geek* used in previous Western literature functioned as a boundary object for the interviewers. *Geek* does not denote a fixed identity or provide an ideal type, yet our understanding of Western geek culture enabled us to see the different meanings of inclusion in CS in different social worlds while simultaneously spotting a "structure [that is] common enough to more than one world to make them recognizable" (Star and Griesemer 1989: 393; see also Lagesen 2010).

Each interview was audiotaped and transcribed verbatim. Although there were individual variations, authors all noted that themes discussed in previous studies regarding geek traits—independence, peer learning, intrinsic motivation, confidence, and social ineptness—were frequently expressed by our interviewees in their description of themselves or other CS students. We coded our interviews without software by searching accounts related to aforementioned themes. By employing mixed-methods research utilizing both qualitative and quantitative data, we examined how respondents identified with or distanced themselves from geekiness (Creswell and Plano Clark 2011).

5 Results

5.1 Independent Learning

As shown in table 2, tendencies to pursue independent learning were significantly higher at top-tier universities than at midtier ones in Korea. Students at top-tier universities more strongly agreed than students at midtier universities (4.04 vs. 3.70) that doing homework for themselves is more important when learning CS than understanding lectures. Googling was also considered to be more informative than lectures by students at top-tier universities and less so at midtier universities (3.44 vs. 2.53).[6]

No statistically significant difference between Korean male and female CS students in their pursuit of independent learning was observed. Both men and women regarded assignments outside the classroom as more important than lectures (3.94 vs. 3.71). Also, both men and women agreed that individual effort, rather than a cooperative-

[6] As noted above, a chi-square test for independence enables us to conclude that when only college rank is associated with differences in students' average score, the association is not explained by gender.

Table 2 Respondents' agreement with survey statements [means (standard errors)]

Statement	University prestige		Gender		*t*-Test for difference in means	
	Top-tier	Midtier	Male	Female	University prestige	Gender
Independent learning						
Doing homework assignments is more important than understanding lectures.	4.043 (0.9077)	3.708 (0.8696)	3.939 (0.8889)	3.714 (0.9088)	2.596*	1.577
I learn more through Googling than lectures.	3.435 (1.0088)	2.526 (0.9983)	3.045 (1.1272)	2.796 (1.0165)	6.189***	1.406
Individual effort is most important in learning CS.	4.304 (0.8219)	3.411 (1.1251)	3.850 (1.1382)	3.852 (0.9398)	6.217***	−0.013
Peer interactions						
Peer interactions promote my CS learning.	3.413 (0.9851)	2.853 (0.9561)	3.226 (1.0561)	2.889 (0.8393)	3.948***	2.300*
Networks of friends and senior peers affect my career development.	4.380 (0.7085)	3.832 (0.7808)	4.195 (0.7330)	3.870 (0.8912)	5.209***	2.578*
Reasons for studying CS						
It is fun.	4.466 (0.6424)	3.660 (0.9788)	4.147 (0.8936)	3.811 (0.9619)	6.61***	2.253*
I am good at it.	3.886 (0.9399)	3.362 (0.9821)	3.729 (1.0365)	3.34 (0.8307)	3.677***	2.43*
It provides employment opportunity.	3.330 (1.0691)	3.766 (0.8728)	3.504 (1.0317)	3.679 (0.8939)	−3.005	−1.082*
Self-confidence						
I am capable of finding job opportunities.	3.703 (1.0055)	3.359 (0.7199)	3.608 (0.9359)	3.34 (0.7323)	2.663**	2.065*
I expect to find a job related to my degree.	4.220 (0.8407)	3.565 (0.8295)	3.938 (0.9129)	3.774 (0.8467)	5.302***	1.131
I find studying CS interesting.	4.242 (0.8478)	3.565 (0.9412)	3.977 (0.9439)	3.717 (0.9683)	5.11***	1.677
Social ineptitude						
There are lots of opportunities for socialization among CS majors.	2.484 (1.1290)	3.152 (0.8636)	2.777 (1.0511)	2.925 (1.0715)	−4.496***	−0.857
I find the classroom climate in CS asocial and unfriendly.	3.231 (1.2209)	2.620 (0.9704)	3.023 (1.1444)	2.679 (1.1055)	3.746***	1.862
I am satisfied with the classroom climate in CS.	3.009 (1.0652)	3.522 (0.7911)	3.300 (0.9934)	3.340 (0.8658)	−3.051**	−0.253

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

learning environment, is most important in the study of CS (both 3.85). Although female students did not agree that they learn more through Googling than through lectures, the difference between the male and female average (3.05 vs. 2.80) was not statistically significant.

We conducted interviews to see how students understand the importance of independent learning outside of classes. When we asked our interviewees to describe students who are deemed to fit well in the CS department—whether themselves or their peers—independent learning was often mentioned as an important characteristic of exemplary students. Both male and female students at top-tier Korean universities frequently mentioned personal programming projects outside of classes, such as participating in hacking contests or taking online programming tutorials for themselves, as valuable experiences for their CS studies:

> I don't take lectures seriously. I don't think lectures are helpful for me, except for a few classes. In my opinion, programming is about learning by doing and hands-on experiences. Listening to lectures does not do much. If I could change the curriculum, I would like to study a lot alone first and ask my questions all at the same time to instructors as people do at some online academies. (male student at a top-tier university, May 2014)

> Some students are really good at it [computing]. We take the same lectures. Yet while some students learn through lectures, others just go ahead and solve problem sets. We take quizzes and midterm exams in classes. But the competition does not end there. Some kinds of aptitude are not evaluated by formal assessments. (female student at a top-tier university, August 2014)

> There is a student's organization. They hacked the web portal run by the university. They became so popular. Those students [in a popular students' organization in the CS department] do not pay much attention to lectures. They don't come regularly or do other things in the back rows. But they are always coding. And they go to contests and get awards. I think they are likely to get good jobs. Some CS majors get good GPAs, but they have nothing to say in the job interviews about their own projects, while others become experienced in this and that as they get along with similar types of people. (female student at a top-tier university, May 2014)

On the other hand, more students at midtier universities mentioned that faculty affect their learning processes significantly. One interviewee explained in detail why she values lectures and supportive faculty in relation to her endeavor to stay in CS:

> I have to focus and not lose track during class. When I can understand the professor's lecture then I become interested [in CS]. I like taking lectures because CS is entirely new to me. I am not very good at coding, but I can understand theoretical principles. If I cannot find anything interesting, I might think I just want to quit. I like lectures because I can understand it. (female student at a midtier university, July 2015)

As the interviewers and interviewees engaged in semistructured dialogues about what an ideal CS student is like, narratives of "always coding" students who do not necessarily get good grades often came up. Independent students were not always labeled as geeks by our interviewees, yet it was evident that many interviewees at top-tier universities regarded students in coding clubs (in other words, students who would be called geeks in Western cultures) more highly than students who only take classes and learn through structured instruction. Our quantitative data suggest that

tendencies to value independent learning—which usually involves working for extremely long hours—as an important feature of CS departmental culture are unequally distributed by college groups in Korea. While previous Western literature mainly found such intense relationships with computers to be associated with masculinity, in Korea being at a top-tier university, together with being male, tends to strengthen one's tendencies to valorize independent learning.

Yet we did not aim to and cannot conclude that the aforementioned independent tendencies are caused by university prestige; there can be other causal variables, such as the respondents' family background or high school education interacting with university prestige. We also do not argue that gender is unrelated to certain geek tendencies in Korea based on our survey. Instead, the implication of our findings lies in pointing out top-tier universities as sites associated with, if not determining, Korean CS students' tendencies to value independent learning. We propose that Korean students' preference for and valuing of independent-learning behaviors, which does not seem to fit well with the simple dichotomy of technical men and social women, needs to be examined more carefully regarding regional contexts of CS learning, such as stratified higher education systems. As Lagesen's (2016) research in Norway, California, and Malaysia demonstrated, the way gender is enacted in constituting software engineers' accounts of their profession differs by context.

5.2 Peer Interactions

Studies on the impact of institutional culture on education agree that the so-called hidden curriculum—certain values, rules, and norms of how to talk, think, and act like a member of an academic community—can be learned most effectively through unspoken communication in peer groups rather than formal education with explicit references (Foor, Walden, and Trytten 2007; Lee and Luykx 2006; Margolis and Romero 2001). Our survey results indicate differences between university groups and gender with regard to the perceived importance of peer interactions in CS learning and career development. Students at top-tier universities agreed more that peer interactions affect their learning (3.41 vs. 2.85) and career development (4.38 vs. 3.83). Men were more likely than women to agree that peer interactions were helpful for their study (3.23 vs. 2.89) and career development (4.20 vs. 3.87).

The results indicate that CS students' appreciation of the hidden curriculum in CS is an unequally distributed trait by college groups and gender. We conducted ANCOVA to control the effect of gender. The aforementioned differences between college groups regarding the two mean scores—how strongly students agree that peer interaction affects their learning and career development—remained significant (respectively, $F = 12.93$, $p < 0.001$; $F = 21.18$, $p < 0.001$). In other words, university prestige still affected students' perceived importance of peer interaction after controlling for the effect of gender.

In our interviews we found that CS majors at top-tier universities were often exposed to geeky behaviors, such as learning outside of classes, through peer interactions. Geeky peers were often narrated as exemplary students:

> I was in a students' organization where we managed web servers together. I felt intimated because some members are too smart. They are so focused and have so

> much passion. Server problems can occur at midnight or during finals week. They [geeky students] come and solve those problems at any time. They really don't exercise at all. So they are not healthy. But I am inspired by the way they push themselves so far. (male student at a top-tier university, July 2014)

> I like geeks so much. They are so good at computing. We have a students' club where we do web development together. Most people have just . . . broad interests and conform to standards. But eccentric people make changes and finish projects. (female student at a top-tier university, July 2014)

Our findings in this category suggest that in Korea geek tendencies to pursue informal learning are associated with university prestige along with gender. Men and students at high-rank universities were more likely to value the importance of peer-based interactions for learning and their future career in CS.

5.3 Motivation: Intrinsic or Extrinsic

Male respondents were more likely to say they chose CS as their major out of intrinsic motivations, such as interest (4.15 vs. 3.81) or their perceived competence in the subject (3.73 vs. 3.34). The difference was statistically significant. Also, students at top-tier universities agreed more that they major in CS because it is fun (4.47 vs. 3.66) or because they feel competent (3.89 vs. 3.36). Students at midtier universities were more likely to report that their motivation for CS studies is derived from perceived employment opportunity (3.77 vs. 3.30), while the score did not differ significantly between gender. Again, we conducted ANCOVA and found that university prestige has a bearing on students' motivation for studying after controlling for the effect of gender.

Tine Kleif and Wendy Faulkner's (2003) research describes software engineers' culture as fun seeking. Software professionals, although they include money or security to explain why they chose computing, list fun as a more essential motivator in their remaining in the field. Roli Varma's (2007) study in the United States noted that low-socioeconomic-class and minority female students mentioned getting a job with a good salary, secure employment, and social prestige as major reasons for studying CS, while middle- or upper-class students tended to mention the intrinsic appeal of programming. Our research adds another dimension to the previous literature; there seems to be a barrier between universities—as well as between gender or class—in terms of students' tendencies to state that fun rather than employment opportunity is their major motivation for studying CS. The following is from an interview with a student at a midtier university who explicitly associated his major with employment opportunity:

> For me, the goal [of studying CS] is to get a job in IT industries. Absolutely. If I don't get a job related with my major, there is no need for me to stay in the CS department. If I just want a graduation certificate, there are other majors with much cheaper tuition like humanities. I studied this subject for four years and paid tuition. I have never thought of making my major useless and [getting] a job in other fields. (male student at a midtier university, May 2015)

Again, from our study we cannot and do not aim to determine whether intrinsic motivation for studying CS is the cause or result of students' affiliation with a

prestigious university. Yet our finding is in itself important as it reveals an association between university prestige and students' identification with geek or nongeek, which remains significant after controlling the effect of gender. Students at top-tier universities are accustomed to expressing their enjoyment of and passion for CS explicitly, while students at midtier universities are more likely to acculturate themselves to talk of employment opportunities as their reason for studying CS. Preference of passion over job prospects as self-proclaimed motivations for studying CS seems to be associated with high-ranked universities as well as with men in Korea.

5.4 Self-Confidence and Interests

Male students responded with stronger agreement that they felt confident in finding information about job opportunities (3.61 vs. 3.34). There were also significant differences between college groups regarding respondents' self-confidence in locating and ensuring employment opportunities (respectively, 3.70 vs. 3.36 and 4.22 vs. 3.57). Students' stated interests in studying CS, which are likely to be linked to their persistence in the field, were also significantly higher among students at top-tier universities (4.24 vs. 3.57). Our findings reveal that Korean CS majors' likelihood to remain confident and interested in CS is affected by their college ranks as well as by gender. Self-evaluated level of confidence and interest in subjects have been noted as important indicators of students' persistence in engineering (Marra et al. 2012). Thus, our results suggest that persistence in CS might be affected by other variables such as college rank as well as by gender in Korea.

Further research is needed to see whether associations between academic prestige, geek identities, and persistence in CS can be repeated in countries other than Korea. We suggest that, in the context where geek identities are culturally associated with power and appeal rather than stigma, the question of which social groups have access to learn, identify with, and acculturate themselves into geek behaviors, not just which social groups avoid geek stereotypes attached to CS majors, needs to be carefully examined when trying to increase diversity in CS. For instance, Lilly Irani's (2015) research on Indian IT and entrepreneurial subjectivity provides a thought-provoking case. Similar to Koreans, Indians are encouraged by public discourse not to "wait for the government" but to commit to individual projects of becoming successful in a global economy through technical mastery and entrepreneurial mind-sets. In such contexts, who has better chances to produce themselves as tech-savvy subjects becomes an important question, one that cannot be answered by explicating who avoids or feels alienated by geek stereotypes in CS. We need to examine more carefully how differences and inequalities are structured within CS learning and professional environments around gender and other social variables.

5.5 Social Ineptness

Social ineptness is frequently mentioned as an image of CS majors. Our survey results found that Korean students at top-tier universities were more likely to consider their institutional culture as asocial or unfriendly even though they highly valued the importance of peer interactions, as indicated in the previous section. Regarding the

statement that there are lots of opportunities for socialization among CS majors, students at top-tier universities showed stronger disagreement than those at midtier universities (2.48 vs. 3.15). Students at top-tier universities also agreed more strongly that their classrooms have an asocial climate (3.23 vs. 2.62) and were less satisfied with it (3.01 vs. 3.52). No statistically significant difference between gender groups was observed regarding students' negative perception of the departmental culture in terms of socialization.

Previous studies argued that women's loss of interest in CS might be related to the departmental culture of socially withdrawn geeks, which women tend to find disagreeable (Barker and Aspray 2006; Margolis and Fisher 2002). Our findings, however, indicate that, while Korean male and female students at top-tier universities agree that their peers tend to be asocial and unfriendly, they still express confidence and interest in CS. It seems that Korean students' tendencies to persist in CS are not necessarily reduced by their perception of departmental culture as being asocial and unfriendly.[7]

In such contexts, it was not surprising that female interviewees at top-tier universities showed a lack of interest when we asked about women's support networks in CS. Women's associations for support or socialization were not understood as helpful resources for their studies or career development:

> I think it's better not to separate women from men. . . . If there is an association for women developers, then, well, if I can be of help, I will help. But I will not actively organize such an association for myself. (female student at a top-tier university, August 2014)

> There is a group of people whom I came to know through hackathons, conferences, or even drinking sessions. People in companies, research institutes, or universities associate together. Or just students like me. Few of them are women, but it's good to meet and socialize with diverse people. I have heard of women's associations in CS but have not attended any. (female student at a top-tier university, July 2014)

It is possible that the stereotypical images of CS majors as technically skilled yet socially inept could increasingly be associated with positive connotations in Western contexts as well. Mass media frequently uses the words *nerds* and *geeks* along with glamorous images of highly paid professionals. For instance, the BBC news magazine on 16 November 2012 (Westcott 2012) reported changed images of geeks: "The 1984 film *Revenge of the Nerds* . . . reveals a certain cultural backdrop—to be a nerd was to be socially awkward, even socially inferior. . . . Today when people think of 'geeks' and 'nerds' they might very well name the likes of Bill Gates, Steve Jobs and Mark Zuckerberg." On 6 March 2015, the *Economist* published an online article titled "Revenge of the Nerds: Which Degrees Give the Best Financial Returns?" To design more effective strategies to increase diversity in CS, we need to investigate further what social and structural conditions promote selected groups of men and women to adopt, rather than avoid being associated with, geek proclivities of technical mastery and social ineptitude.

[7] Pearson correlation tests showed no statistically significant association between the survey question "I find the classroom climate in CS asocial and unfriendly" and any of the three questions regarding self-confidence.

6 Discussion

In summary, we found that Korean students' identification of themselves with geekiness was associated with university prestige more frequently than with gender.[8] University prestige, in addition to gender, works as an important factor in structuring unequal opportunities to embody geeky behaviors and mind-sets. Our ANCOVA results confirm that top-tier college students' higher tendencies to identify with some geeky proclivities—such as valuing peer interactions for learning and intrinsic motivation for study—remain significant even after controlling for the effect of gender. We can interpret the results from surveys and interviews as follows. Students at top-tier engineering universities in Korea are more likely to have intrinsic motivation to study and to pursue intense extracurricular learning than are students at midtier universities. Students at top-tier universities also show higher levels of confidence along with higher tendencies to value peer-based networks as useful resources for studying and career development. Our findings suggest that gendering in and of CS is more complicated than the dichotomy of male-technical versus female-social stereotypes. The geek identities often associated with masculinity in Western contexts are interpreted differently in Korea, as both men and women at top-tier universities discursively construct the cultural contexts where behaviors such as independent learning and fun seeking are valued. To our knowledge, this is the first research to examine how CS students' identification with or separation from geek identities can be associated with social variables other than gender and race.

The image of tech-savvy and socially inept geeks has usually been regarded as associated with masculine behaviors in Western contexts, which alienate women not only from CS but also from other engineering disciplines. Adding social purposes to technology is a strategy used to recruit more women into STEM fields. Here women are understood to prefer work that can make a contribution to people in society over narrowly focused, abstract calculation (Hill, Corbett, and St. Rose 2010). Subsequently, emphasizing the social relevance of engineering and changing the antisocial image of engineering professionals have been suggested as strategies for gender inclusion (American Association of University Women 2000, 2015).

Our research, however, demonstrates that we need to conduct careful analyses that consider the possible intersection of gender and other social factors to understand under what circumstances women (and men) become more people oriented or occupied with technical mastery (i.e., being geeky). While we do not aim to deemphasize gender in constructing students' practices and identities in CS, it is important to analyze how gender in its relation to contexts appears more or less noticeably in CS professionals' discursive identities, as suggested by Lagesen's (2016) research in California, Malaysia, and Norway. We propose that designing gender-inclusive policies in CS and STEM needs to be based on a more careful understanding of how multiple forms of masculinities and femininities (e.g., their intersection with class-laden identities and university rankings) can emerge around technology depending on

[8] Some geeky proclivities, such as tendencies to value peer interactions for learning and to study CS as fun seeking, were associated more with men than with women. Again, we do not aim to argue that gender is insignificant in the construction of CS practices and identities in Korea. Instead, we call attention to the context of university prestige as an important factor in Korean students' identification with geekiness.

the regional contexts. Further research is needed to see if the pattern in our study—university prestige associated with students' identification with certain geeky tendencies even after controlling for gender—is observed in countries other than Korea.[9]

Our research is not about celebrating Korean women's adoption of geek identities in top-tier universities as an example of gender bending. On the contrary, it is about paying more careful attention to the processes through which the constructed symbolic hierarchies—geek over nongeek and masculinity over femininity—are mediated by unequal structures, including but not limited to gender imbalances in CS. We highlight that, although our interviewees all articulated their learning-related habits in personal terms—for example, "I would like to study a lot alone first" or "When I can understand the professor's lecture, then I become interested [in CS]"—our research clearly demonstrates that such seemingly personal proclivities are not so personal. Geek proclivities are unequally distributed by gender and college groups while Korean university students endeavor to produce themselves as subjects who fit in CS. Further research is needed to fully elucidate the mechanism through which fitting into the CS culture is coded not only with masculinity but also with university prestige in Korea.

During our research, we had an opportunity to attend a job fair held by a leading mobile game company at the Korea Advanced Institute of Science and Technology, the top university for engineering in Korea. The company representative said: "I work a lot. I enjoy working with smart and passionate people. Working with dull people is quite tiring. But when I enjoy working, work becomes easy. We have teams for ten different foreign languages. We are ready for the global market. Sometimes we leave for Shibuya in the morning, work from 2 to 4 pm, and then come back to Seoul. To make cool stuff, we can pull all-nighters cheerfully. We enjoy work itself" (personal communication, 15 May 2015). The job fair was a vivid illustration and celebration of geek masculinity—focused, tech-savvy, fun seeking, and socializing mainly with like-minded people—as desirable traits for anyone who wants to participate in the global knowledge-based economy. Yet geek behaviors and mind-sets seem to be distributed unequally along the axes of gender and university prestige in Korea. Our research suggests that in Korea public discourse and (more) top-tier, (more) male university students' personal accounts alike valorize geeky behaviors in CS. Here students who have little prior experience in programming are likely to feel intimidated by those who do not take lectures seriously and just want to learn through independent problem solving, Googling, and peer-to-peer interaction.

Korean women in CS perform double labor to be taken as potentially valuable assets in high-tech industries. First, they assimilate themselves into the highly appreciated geek culture constituted by gendered symbols and valorization of selective learning behaviors. Second, they discursively obscure the structural inequality by describing their geeky tendencies as personal traits. The trope of successfully integrated women in CS works as a technology and produces subjects who understand and talk about their belonging to CS as a strictly apolitical and asocial matter of individual difference

[9] The way gendering of CS takes shape depends on local contexts and thus complicates the binary understanding of geeky males versus social females has been recently noted by Lagesen (2016), with emphases on ethnicities, professionalizations, policies, and spatial concerns. Our study adds the necessity of including high-ranked universities as a site to produce geeky behaviors as norms for both male and female students in CS.

("there are people who do not work overtime; we want to make something"). Yet as observed from the survey data, their tendency to embody geeky behaviors as their own is a structured trait affected by gender and university prestige. The power-laden contexts in which geeky individuals emerge need careful attention in designing strategies for gender inclusion.

Overall, our research demonstrates that gender inequality in CS needs to be investigated under a more nuanced framework than technically oriented men versus socially oriented women. Korean students who hold advantageous positions in the stratified higher education system identified more closely with and valued geeky masculine proclivities. Importantly, despite some Korean women's advancement to top-tier engineering universities, technology still works to reinforce certain power relations in society—in this case, the difference between top-tier and midtier universities in Korea. Geek masculinity in Korea is constituted as a trait that top-tier universities can and do embody better than others. Distinct processes of becoming IT professionals divided by college ranks are likely to result in as yet underresearched forms of inequality in CS. Even with selected women in top-tier universities who will advance in Korean IT, the industry is still likely to be dominated by a geek culture problematized in Western contexts and to lack diverse forms of expertise. We argue that Korean students' division regarding geek proclivities indicates the problem of structural inequality in CS, which includes but is broader than the problem of women's underrepresentation. Geek masculinity in CS and university prestige mutually constitute each other in Korean society, where selective sites, such as top-tier universities, are produced for tech-savvy subjects.

With our findings, we propose that gender-inclusive policies focusing on recruiting socially oriented women, despite their good intent, need more critical examination and extension to solve diversity problems in IT in non-Western (and perhaps Western as well) contexts. We need more strategies for developing CS curricula that fit the interests of technical men and social women. We need to analyze what distinct sets of behaviors and mind-sets are valued, gendered, and culturally coded in what regional contexts, and we need to examine further how class cleavages in IT form through the intersection of social variables such as gender, race, and college rank. Based on this understanding, we will be able to design efficient ways to reformulate CS learning environments so that previously less valued forms of masculinities and femininities can also be performed, articulated, and associated with IT.

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