A SURVEY OF GENDER ISSUES RELATED TO COMPUTER MUSIC AND STRATEGIES FOR CHANGE

Mary Simon
Center for the Performing Arts and Technology
School of Music - University of Michigan
+1 (313) 936-0425 / msimoni@umich.edu

ABSTRACT: A growing body of literature is forming on the topic of gender and education which documents the attitudes of females and males and the subsequent manifestation of these attitudes into gender differences in science and engineering. Concurrently, an emerging feminist musical aesthetic strives for recognition within a complex network of culture. The author summarizes the literature on gender differences in disciplines related to computer music and develops a hypothesis for the disproportionate number of females in computer music. The framework of an emerging feminist aesthetic is explored and recommendations are made to achieve greater representation by females in computer music.

1. SURVEY OF THE LITERATURE ON GENDER ISSUES IN SCIENCE, ENGINEERING AND MUSIC

Computer music, by its very nature, is multi-disciplinary. We represent the technical fields of mathematics, engineering and computer science grudgingly intertwined with the humanistic fields of musical composition and performance. Why is it that there are so few females represented in our work? Although this question has not been the target of a rigorous social study, it is possible to develop a hypothesis based on research conducted on gender issues in the technical fields of mathematics, engineering and computer science as well as music.

1.1. ELEMENTARY AND SECONDARY EDUCATION

One of the most influential forces in the process of socialization is education. Education occurs by formal means, such as schooling, and through informal means, including parenting and interaction with the extended family and peers. From early childhood, females and males learn critical life skills through formal and informal means. During these important formative years, females and males progress through the various stages of the development of identity. A developing sense of identity is quite often linked to sex. In the early primary grades, one can readily observe instances of sex-linked identity development such as females and males forming single-sex social entities during play. The biological differences of sex give rise to the socio-psychological differences of gender.

Interactions between females and males during the early primary grades may be characterized as tolerant yet gender-appropriate. Specifically, children tolerate the behavior of the opposite gender, yet they seem to prefer activities with children of the same gender. As females advance to adolescence, a precipitous drop in self-esteem is generally observable [Robertson]. In fact, the decline of self-esteem in females is in times that of males [AAUW]. A reduction in self-esteem will likely have a negative influence on a personal sense of achievement. Some studies have documented that many adolescent females demonstrate a diminished sense of achievement by attributing personal success to luck, and failure to a lack of ability. These same females quite often overestimate the difficulty of unfamiliar tasks and are generally hesitant to take risks. The willingness to take risks is thought to promote success in scientific careers [Acker and Oates]. From these studies, some researchers have concluded that mathematics and science are perceived as incongruent with the development of female identity [Robertson].

There is a documented correlation between low self-confidence and mathematical ability. Some adolescents suffer from what is termed mathematics avoidance—a conscious or unconscious decision to cease the study of mathematics. In more pronounced cases of mathematics avoidance, a student may actually display physical signs of anxiety. Researchers have correlated high anxiety in mathematics with lower achievement in mathematics [Betz; Fennema]. Researchers have also observed that females typically exhibit higher levels of math anxiety than males. Many people still believe that it is socially acceptable for females to perform poorly in mathematics. Consequently, females are less likely to be encouraged to confront their
anxiety than males. Mathematics avoidance and mathematics anxiety could easily deter students from pursuing disciplines that require mathematics, or at the very least, delay entrance into technical fields [Campbell & Geller].

Related studies document that male students receive more attention, reinforcement, and affective contact from high school mathematics teachers than do females. It is a well-documented occurrence that when a teacher asks a question, it is more likely that a male will call out the answer than a female [Sadker et al.]. The frequent recognition of male students creates a powerful gender-role socialization process characterized by a complex student-teacher behavioral pattern. Many teachers, either consciously or unconsciously, have differing expectations for females than males. It is human nature to behave in a manner consistent with one's own beliefs and expectations. Teachers who hold different expectations for females and males discriminate in a manner consistent with these expectations. There is a tendency for students to mirror the expectations of their teachers. The resultant behavioral paradigm tends to reinforce behaviors that are consistent with the expectations of the teacher. If, for example, a teacher holds the expectation that a student cannot succeed in mathematics, that expectation is willingly or unwillingly communicated to the student, and the student mirrors the expectation. These subtle, yet powerful messages, diminish the potential for some students, mostly females, to excel in mathematics. Worse yet, if the student is prone to mathematics avoidance or anxiety, the lack of positive teacher interaction may further its development [Becker; Measor; Sadker et al.].

High school computing facilities are oftentimes located in technical areas such as mathematics and the sciences, and computing courses are quite often taught by mathematics faculty. The implication of the location of the computing facilities is that the study of mathematics is a pre-requisite for the study of computers. In fact, many schools require successful completion of mathematics courses prior to the study of computers. Some researchers argue that such policies and practices reinforce the perception that computing is a male domain [Collins]. If females are not encouraged to study mathematics, and if mathematics are a pre-requisite for computing, then few females succeed in computing.

But not all schools create bureaucracies that inadvertently exclude females. Some females are excluded by their male peers. In an intensive study of gender roles and computing in eighteen Canadian elementary schools over a two-year period, researchers found that there was virtually no sharing of knowledge about computing between females and males. In fact, males engaged in aggressive behaviors including discouraging females from using computers by scaring commitments, starting to print when it was a female's turn and staring computers as females ended up with less powerful machines [Carmichael; Burnett; Higgins, Moore & Pollard].

The study of music, particularly in the secondary schools, is similarly plagued by gender-based discrimination. Music, particularly choral music and performance, is widely viewed as a female domain. In many cases, males are discouraged from their study of music, particularly by their peers. Social stereotyping during adolescence often encourages males to participate in athletics sometimes at the expense of their participation in music.

1.2. HIGHER EDUCATION AND BEYOND

Females were first welcomed into higher education at the University of Michigan in 1870 followed by the University of Chile in 1877. By 1970, 46% of the student population at the University of Chile was female. In Japan, Western Europe and Latin America, females made up 33% of the university population by 1985. During the same time, 45% of the student body in the Philippines was female in sharp contrast to only 22% in India [Gonzalez].

1.2.1. SCIENCE AND ENGINEERING

Much literature exists on the recruitment and retention of females in science and engineering in higher education, presumably spurred by the disproportionately low female representation in these areas. One study indicates that females are less likely to persist than males in some computer-related fields during the undergraduate years [Jagacinski, LeSoly, and Savendy]. Persistence is defined as a student graduating with a degree in the same major field as declared during the freshman year. Consequently, a student who changes her or his major, or withdraws from college, is termed a non-persistor. By the beginning of the sophomore
year: 53% of the males and only 20% of the females persist in their study of computer science. The results of this study are consistent with a previous study that found that 49% of the males and only 27% of the females persist in their study of computer science [Campbell & McCabe].

The number of female Ph.D.s in science and engineering in the United States has increased from 9% in 1970 to 21% in 1979. Science and engineering fields include physics, astronomy, chemistry, earth sciences, mathematics, engineering, biological sciences, agricultural sciences, medical sciences, psychology, and social science. The highest proportion of female Ph.D.s is found in psychology, reporting 24%, with the lowest percentage in engineering, only 2%. The unemployment rates for doctoral scientists and engineers are not proportionately distributed by gender. In 1979, when unemployment was at an all-time low for all Ph.D.s in science and engineering, females were four times more likely to be unemployed than males [Venter].

An exhaustive study of the professional status of females in India documents the incidence of unemployment for female Ph.D.s in science and engineering [Jaywalk]. It was found that in 1993, 44% of the females were unemployed whereas only 26% of the males were unemployed. Seventy-four percent (74%) of the females stated that they had been unemployed since graduation, 12% left a job when they were married, 7% left a job due to child care responsibilities, 6% left a job to pursue independent research and 1% left a job because it was their parent's wish. These data demonstrate the difficult road to success in science and engineering for females in India where 1 in 5 females are unemployed because of gender-role stereotyping, specifically—marriage, child care responsibilities and parental expectations.

Salaries in science and engineering fields in the United States vary by degree, field, experience and employment sector. A study of salary differences by sex has documented that upon entering the workforce immediately following a Ph.D., a female could expect her salary to lag 11% behind that of a male. The salary difference widens with years of experience indicating slower promotions for females [Venter].

1.2.2. MUSIC

The number of female Ph.D.s in music in the United States has steadily increased since the 1970s through the mid-1980s from 16.3% in 1971 to 35.9% in 1986. Although an increasingly larger number of qualified females are seeking positions in higher education, the National Association of Schools of Music has reported a loss of 1,500 positions between 1982 and 1986. In 1986, females made up nearly 40% of the non-tenure track faculty positions and only 23.2% of the tenure track positions. Of these tenure track positions, one readily finds females in disproportionately large numbers in the stereotypically female domains—specifically 67.9% in early childhood education and 49.8% in elementary education. Females have yet not infiltrated the stereotypically male domains of highest education with only 4.2% of the positions in boast conducting being held by females, 5% in jazz and 5.5% in brass. Of the 1,220 tenure track positions offered in music composition in 1987, only 8.6% went to females [Jezer]. One can speculate that due to these 8.6%, but a small fraction are females working in electro-acoustic and computer music. In fact, a study in the early 1980s found fewer than twenty women working in computer music in higher education in the United States [Edwards]. A forthcoming book promises to be an thorough search of women in electro-acoustic music as well as documentation of their persistence in the field [Hinkle-Turner].

2. HYPOTHESIS BY ANALOGY

Given the overwhelming evidence represented by these studies, one can hypothesize that the reason there are so few women in computer music is because the complex process of socialization has simply filtered them out. Think of the rich myriad of cultures that we term civilization as white noise. Analogous to the process of subtractive synthesis, socialization removes classes of people by passing them through a series of filters. The cascade of filters is education and employment. As is well documented in filter theory, it is nearly impossible to attain ideal attenuation in subtractive synthesis. Consequently, those few females that pass through the series of filters, escape only to find that their signal strength has been attenuated by 3 dBs.
3. AN EMERGING FEMINIST AESTHETICISM

Feminist aestheticism, albeit elusive and unassimilable, appears to be emerging in the field of computer music. The aesthetic may be characterized as an expression of feminine experiences and seems to manifest itself predominantly through musical composition and performance art. Females who seek to develop a personal aesthetic are often interested in advancing the qualities associated with their own femininity and take joy in celebrating the expression of these qualities. Not all feminist works should be approached formally. Inconsistencies may result from evaluating the work outside the cultural context in which it was created. Instead, these works should be approached with a willingness to explore the socio-psychological framework from which they come [Con].

4. PROSPECTS FOR CHANGE AND A CALL FOR ACTION

Many of the studies represented here are just beginning to influence a social system. The American Association of University Women (AAUW) has numerous gender equity programs designed to reverse the trends presented in the research. These programs are in place at virtually all levels of the American educational system. As a result of these efforts, educators and students alike are beginning to pragmatically discuss gender issues that affect education such as access, harassment, child care, and poverty. Increased awareness on the part of all brings new challenges and hope for generations to come.

What does this mean for computer music? Since the International Computer Music Association (ICMA) and its International Computer Music Conference (ICMC) are widely regarded as the premiere entity for promoting scholarly and creative research in computer music, both ICMA and ICMC have a responsibility to develop programs specifically designed to promote gender equity. Without such programs, the organization runs the risk of omitting a class of scholarship. Several considerations are important in developing programs designed to promote gender equity as outlined below.

4.1 GET THE FACTS

Collect and perform a quantitative and qualitative analysis of participation by sex in both the ICMA and ICMC.

4.2. ADOPT A PROACTIVE STANCE

Acknowledge that there exists a gender gap and target funds to increase participation by females.

4.3. DEVELOP INTERVENTION STRATEGIES

Support those agencies that combat gender discrimination in education.

Examine our own teaching methodologies and change those that may discriminate by gender.

Identify those institutions that are graduating females in areas related to computer music and offer support through mentorship and scholarship programs.
4.4. NURTURE FEMINIST AESTHETICISM

Offer panel discussions and forums on feminist aestheticism.
Sponsor a composition contest for females juried by females.

5. IN CLOSING

There exists a preponderance of evidence of a need for change within the social context of our discipline. Such change will foster breadth of scholarship and diversify the art. Without change, we run the risk of silencing future generations of artists and scholars.

REFERENCES


[Hinkle-Turner], Elizabeth Hinkle-Turner. Forthcoming book that surveys women working in electro-acoustic music.


