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DAW democracy? The dearth of diversity in 'Playing the Studio'

ABSTRACT

In theory anyone with a computer, tablet, or smartphone can 'play the studio', but is this reality or rhetoric? The putative democratization of recording technology is tethered to a basic economic argument – affordability equals access – while analyses of the sociocultural conditions of this mode of music making have been largely overlooked. Considering that playing the studio is an elemental practice in the making of many popular musics, the implications of this inquiry are relevant to all dwellers on the delta of where music, technology and education meet. First, I provide a concise history of the concept of playing the studio to frame the subsequent discussion on diversity in this practice, particularly as it relates to gender. Second, I report findings from a survey I conducted in New York City on playing the studio, which confirm this practice is predominantly the preserve of white, male guitarists. The dearth of women in the sample (11%) serves to elucidate the reality that the supposed 'democratization' of music making ushered in by the DAW has not actually occurred. Third, I contextualize these findings with a discussion on related research to affirm that the underrepresentation of women in playing the studio is consistent with the history of recording studio culture, and more broadly with Bourdieu's notion of 'masculine domination' (2001). In conclusion, I suggest that in order to de-gender the masculine/feminine binary implicit in software and hardware for music production, educators and students alike need to infiltrate the design process and be active agents in the development of the technologies they will use to make music.

KEYWORDS

gender
digital audio
 workstation
home recording
project studio
audio engineering
masculine domination

INTRODUCTION

As a popular musician, my music-making experiences have been immensely enhanced through the use of Digital Audio Workstations (DAWs) since my first forays into computer-based recording in the early 2000s. While I had some prior experiences using analogue recording technologies such as a tape recorder and a four-channel mixer during my adolescent years, I am for all intents and purposes a millennial when it comes to sound recording. Firmly ensconced in the digital domain of computing, my frame of reference for recording is the DAW because my first digital multitrack recordings were made using this technology. My family owned an inexpensive generic desktop PC and the rationale for its purchase was schoolwork, specifically word processing. No one in my family used the computer frequently (my parents were frightened of it) and aside from being used to type up the occasional English essay, our PC hibernated most days and nights. That was until I stumbled upon my first DAW – Data Becker Music Center – a derivative program that attempted to emulate (industry standard DAW) Pro Tools at a fraction of the cost, which it partially achieved by offering a fraction of Pro Tools' functions. Data Becker Music Center's shortcomings notwithstanding, it provided me with a means to accompany myself. I learned how to play the drums, guitar, electric bass, and even sing to an extent by overdubbing myself repeatedly using this DAW. This was a godsend because growing up in small-town rural Canada I did not have access to many opportunities to play popular music with others. Although I was oblivious to the significance of what I was doing at the time, I was in effect playing the recording studio, that is, using 'the studio as musical instrument' (Moorefield 2010).

RESEARCHER ORIENTATION AND RESEARCH QUESTIONS

I offer the above personal anecdote in the interest of transparency; my orientation to research on DAWs is one that is unabashedly in favour getting these technologies into the hands of more music learners. If a DAW can entice a newcomer to music, or enrich the experience of a veteran music-maker, then I want to help bridge their respective interests in music technology to making music. As a music educator, my trade is crafting music-making experiences for learners across the lifespan, from the amateur to the adroit. Therefore, when I read claims about the great democratization of digital recording technologies such as DAWs bringing music-making to the masses (i.e. Leyshon 2009), I am encouraged, even inspired. Utopian visions of the full spectrum of the human race recording their own songs dance through my head, but I realize I am blinded by my biases. Such idealism is unrealistic, which leads me to ask, 'who else is recording music in their bedroom or similar home/project studio?'. Does the DAW democracy exist? In theory anyone with a computer, tablet, or smartphone can 'play the studio', but is this reality or rhetoric? Considering that playing the studio is an elemental practice in the making of many popular musics including hip hop (Schloss 2004/2014), electronic dance music (EDM) (Butler 2014) and rock (Zak 2001; Moorefield 2010), the implications of this inquiry are relevant to all dwellers on the delta of where music, technology and education meet.

In the proceeding pages of this article I provide a concise history of the concept of 'playing the studio' to frame the subsequent discussion on diversity in this practice, particularly as it relates to gender. The impetus for this

inquiry stems from a survey I conducted in New York City that was initially designed to identify and invite volunteer participants for in-depth case studies on learning practices involved in playing the studio. Upon reviewing the responses to the survey it became apparent to me that the topic of diversity, or lack thereof, deserved a deeper discussion. By identifying who – and therefore who is not – 'playing the studio', the survey serves as a means to probe why some populations more than others are on the outside looking in at this mode of supposed democratic music-making.

PLAYING THE STUDIO: A BRIEF HISTORY

Fundamental to this study is the concept of the recording studio as an instrument that can be played. It is critical to appreciate the fact that in the history of recording there is a long-standing mentality that recording music is simply the process of capturing a musical performance in real time (Kealy 1990). Sterne (2003) and Katz (2004) both provide ample evidence to dispel this fallacy by explaining how the recording process itself influences the musical performance. Further, the technology used in the recording process mediates the musical performance, making those individuals who operate the recording technology participants in the act of music-making (Zak 2001). Morton (2000, 2004) details how musicians often had to adjust their practices to conform to the capacities of the recording studios of the early twentieth century, such as altering their natural playing formations to obtain the optimal musical balance on the recorded medium. The idea that the recording studio is a neutral space where music is simply captured to a medium is misguided; recording is not just a product, it is a process too.

Long before the DAW's advent, recording technology was used to perform popular music in the process of recording it. For example, although he was not the first musician to employ the technique of overdubbing, jazz guitarist Les Paul is the oft-cited trailblazer of home recording mastery, producing recordings in the late 1940s and early 1950s that were futuristic to the ears of the music-listening audiences of the day. He sped up his recorded guitar riffs and solos to create new timbres played at superlative speeds, and seemed to defy the laws of time by accompanying himself on guitar or having his wife Mary Ford sing with herself using a technique he coined 'sound-on-sound':

> He would record a track onto an aluminium disk, and then record a second track on another machine, while the first machine played back his first track. The second machine would thus capture Paul's live second performance as well as his recorded first performance. Then he'd begin the process again with the third performance. In this way, he would layer part upon part until he had a finished piece.
>
> (Milner 2009: 125)

Just as Les Paul's recordings with Mary Ford featured impressive overdubbing – making two performers sound like twelve – Chicago-based recording engineer Bill Putnam achieved a similar feat by having Patti Page sing with herself in the 1947 recording of 'With My Eyes Wide Open I'm Dreaming' (Sutheim 1989). The technique of overdubbing pioneered by the likes of Les Paul and Bill Putnam in their project studios changed what recording was understood to mean: 'The products of multitrack recording were not generally "recordings"

in the sense of being a reproduction of the event of a performance (as was initially the case). Rather, the "recording" process had become an event (or, strictly speaking, a series of events) in itself' (Gibbs 2010: 328). The 'event' ethos of recording permeated studio practices in the proceeding decades, which has been well documented, especially in scholarship related to the Beatles (e.g. Emerick and Massey 2006; Lewisohn 1998; Martin and Hornsby 1979; Ryan and Kehew 2006). By the late 1960s overdubbing in recording was commonplace and increasingly musical artists came to see the studio as a *way* to make music, not just a *place* to make music.

Simons (2004) theorizes that the processes of overdubbing and multi-tracking led to the decimation of the 'golden age' (1950–1980) of New York City recording studios, a trend that likely extended to other major recording centres as well (e.g. Los Angeles and London). As the number of tracks that could be recorded onto a reel of tape increased, the possibility of recording one instrument per track increased in tandem, thereby diminishing the need for studios to be large enough to accommodate all of the musicians in a group playing simultaneously: 'By the 1990s, nearly all of New York's largest studios – RCA, Mediasound, the Pythian Temple, Webster Hall and others – had ceased to exist, their equipment sold at auction and the buildings transformed into offices, apartments and nightclubs' (Simons 2004: 160). Théberge matter-of-factly rebuts, 'the general feeling among many producers and engineers is that studios everywhere are closing but the evidence to support this feeling is largely anecdotal' (2012: 78). He explains that what has occurred is not a reduction in the number of commercial studios, but rather a replacement of them with 'project studios' (defined as a home studio that performs commercial work). In the United States between 1997 and 2002, the number of commercial studios grew 18 per cent, and between 2002 and 2007, the rate of growth was 13 per cent, with one-third of these studios being in either California or New York (2012: 84).

As a hobby or pastime, home recording has a long history dating back to the first phonographs that enabled sound reproduction *and* sound recording (Morton 2004). By the 1970s, TASCAM/TEAC led the surge of multitrack reel-to-reel recording into the domestic space and the home recording trend continued to gain popularity in the 1980s with the release of more affordable multitrack cassette recorders (Alberts 2003). Arguably, until DAWs became affordable to consumers in the early 2000s, the art of playing the studio as an instrument was not a widespread practice. Certainly DAWs were available to consumers prior to this period, but the cost was prohibitively expensive for most people. By the 2000s, 'cracked' (illegally acquired) versions of PC platform DAWs such as Cool Edit Pro (1997), Fruity Loops (1998) and ACID (1998), often accompanied by 'keygens' (serial number key generators to unlock the software), could be rather easily obtained online, especially in university and college campus dormitories where broadband Internet connections made the transfer of larger files faster and more feasible than was possible with the dominant home Internet transmission technology of the 1990s: the 'dial-up' modem. In the ensuing decade, playing the studio 'in-the-box', whether it was making beats with Fruity Loops, mashups with ACID or multitracking guitars in Cool Edit Pro, steadily gained traction in mainstream popular culture. At present it seems that the practice of playing the studio facilitated by similar software successors is becoming increasingly more accessible as applications that were once restricted to use on desktops and laptops are transitioning to being mobile-compatible and cloud-based

(van Geelen 2014: 563). Browser-based DAWs such as Soundtrap and Soundation exemplify 'the network studio' (Théberge 2004), in which the construct of 'the studio' shifts from existing as a physical entity to a virtual one using remote collaboration (Koszolko 2015). But is access the solution or simply a single variable in a more complex equation? The putative democratization of recording technology is tethered to a basic economic argument – affordability equals access – while analyses of the sociocultural conditions of this mode of music-making have been largely overlooked.

SELF-SELECTING SAMPLING

In an effort to discover some of the extent to which affordability of access has led to the democratization of recording technology, I designed and administered a survey (Appendix A) employing a non-probability method that recruited self-selecting volunteer participants online. The major disadvantage of utilizing a self-selected sample is that there is no way to estimate population parameters and therefore make generalizations from the results (Wright 2005). However, Wright also contends that this method, 'takes advantage of the ability of the Internet to provide access to groups and individuals who would be difficult, if not impossible, to reach through other channels' (2005: n.p.). The home recording population in New York City is a prime example of this phenomenon; while there is abundant evidence of a home recording community online (e.g. Facebook groups, discussion boards, YouTube channels, etc.), no organized population of members exists from which to randomly sample. Therefore, I cannot claim that the results of this survey reliably represent the home recording population of New York City, but I can provide an accurate portrait of those individuals who volunteered to participate in the survey. The story the data tell is about those individuals who are most willing and eager to contribute to a research study about a practice that is presumably important to them, but it also has a subplot about those who are noticeably absent. While the analogue analogy of being 'behind the glass' is no longer applicable in the digital domain, clearly there remains a conceptual curtain that veils some more than others from playing the studio.

PROCEDURE

For six months, an advertisement to participate in the study by completing the online survey was posted in the community section of the classifieds site Craigslist, under the category 'musicians'. The compensatory incentive for voluntary participation was the possibility of winning a 50-dollar gift card at Amazon.com (or a preferred alternative music instrument retailer) by way of a random draw from the participant pool. Other methods of recruiting participants were attempted, such as posting advertisements in music retailers (instruments and recordings) and live music venues as well as popular online discussion boards including homerecording.com, recording.org and geartslutz. com, but these efforts yielded very few responses. I suspect that the Craigslist posting yielded the greatest number of responses because it provided the lowest barrier to participation; responding to the paper-based advertisements required an extra step of e-mailing or calling the researcher and accessing the advertisements posted in the online discussion boards required an added – albeit quite easy – step of registration. The advertisement was reposted twice weekly and yielded an average of five responses per repost. Like mail-based surveys, online surveys are susceptible to participants misrepresenting

themselves (Schmidt 1997) and honest and accurate responses to the survey items are assumed.

A total of 128 people commenced the survey. Duplicate and incomplete responses were removed, and the survey responses received from people living outside of New York City were not factored into the analyses. Following the removal of these cases, the number of completed responses was 104. In some instances, participants were not required to respond to a question or opted not to answer a question. As a result, many of the items reported on were answered by a smaller sample. In the interest of transparency, the size of these sub-samples is reported for all items.

RESULTS RELEVANT TO THE DISCUSSION
Demographic information

A total of 89 per cent (*n*=93) of the respondents (*N*=104) are male. The mean age of the participants is 33.6 (SD=11.6), higher than the median, 30, and the mode, 26. Taken together with the skewness ratio (0.9), Figure 1 confirms the age distribution is skewed right.

While the age range of the sample is large (18–64), almost half of it (48%) is under the age of 30, and 65% of it is under the age of 35. The sample (*n*=102) is dominated by respondents identifying as white/Caucasian (71%, *n*=72). The second highest race represented is African American, comprising only 13% (*n*=13) of the sample. 'Other' responses – the option that allowed participants to enter their own category – included 'middle eastern', 'mixed race' and 'black man'. Figure 2 depicts the racial diversity within this population.

Musical background

A total of 90 participants reported that they played an instrument or sang. Guitar ranked the highest with 49% of the sample (*n*=44) listing it as their primary
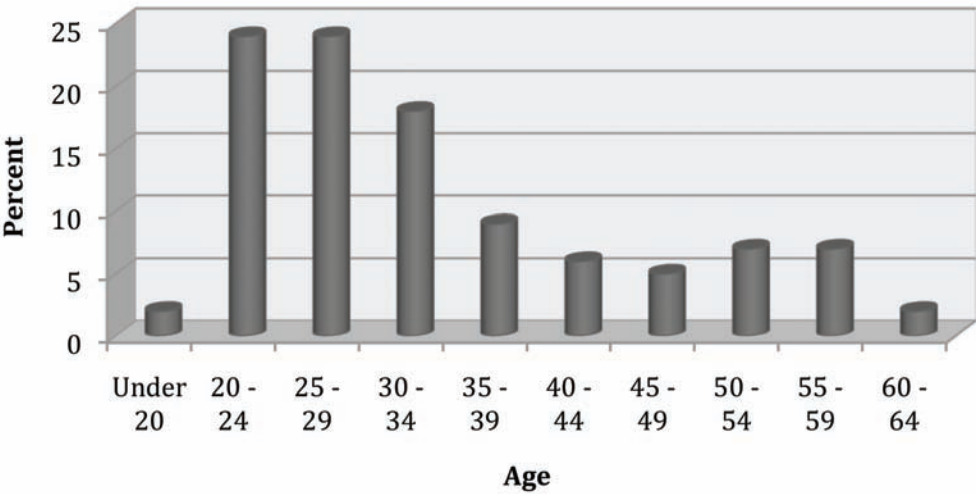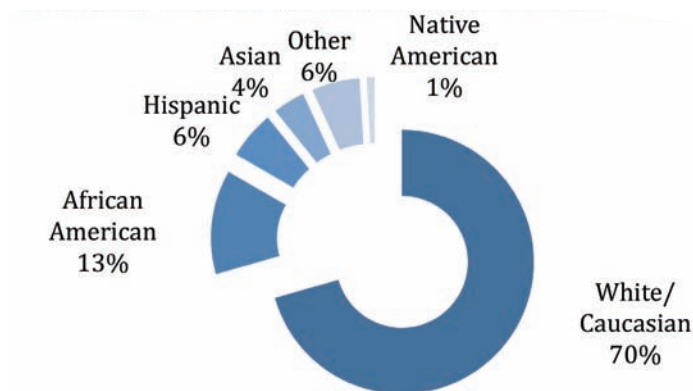

Figure 1: Right skew of age distribution.

Figure 2: Racial distribution of the sample.

instrument. Piano was the second most frequent response, accounting for 19% (*n*=17) of the sample, followed by voice (11%, *n*=10) and finally bass guitar and drums each tallying 9% of the sample (*n*=8; *n*=8). Of this sample (*n*=90), 88% (*n*=79) played more than one instrument. The guitar was by far the most played instrument amongst the sample; 82% (*n*=74) played it whether it is their primary, secondary or tertiary instrument. Participants were also asked to rate their over-all level of musical training on a scale of 1 (no musical training) to 10 (profes-sional) and the mean score for the 91 respondents was 6.8 (SD=2.8). In response to the question, 'Have you studied music performance at the college level, at a conservatory, or privately with a teacher?' 79% (*n*=76) of the sample (*n*=96) responded 'Yes'. While over half of this sub-sample (54%; *n*=41) had studied music performance for four years or less, the most frequent response was 'More than 10 Years' (24%; *n*=18).

Recording background

Only 32% (*n*=30) of the sample (*n*=93) had formal training in audio engineer-ing or music production, but close to half, 48% (*n*=45) of the sample (*n*=94), had been recording music for more than ten years. The second most frequent response was four years, accounting for 12% (*n*=11). The average response was approximately nine years (*M*=9.3, SD=3.2). Most of the sample, 85% (*n*=80), recorded their music with a computer. A total of 49% (*n*=39) used a desktop, 44% (*n*=35) used a laptop and the remaining 7% (*n*=6) used a tablet such as an iPad.

DISCUSSION: THE DIGITAL DIVIDE

In search of the answer to the question, 'who is playing the studio?', I found a cohort of doppelgängers. I might as well have just looked in the mirror because if one were attempting to typecast a representative of this participant pool, *he* would be a white guitarist approaching 30 years of age. In short, the practice of playing the studio remains the preserve of white guy guitarists. This raises the more intriguing question, 'who is *not* playing the studio and why?'. The results illuminate considerable demographic imbalances amongst the population of home recording practitioners in New York City. The survey cast a wide net and any of the items could serve as a springboard for a deeper discussion, but the

most blatant imbalances illuminated by the data analysis relate to racial and gender divisions. Considering that 70% of the sample is white, far exceeding the current proportion of whites in New York City, which is 44% according to the latest census (U. S. Department of Commerce, United States Census Bureau 2013), it seems a fair assumption that white men have continued to play the studio in the digital era, while other subpopulations have been slow to adopt these practices. Second, but certainly not secondary in importance, the dearth of women in the sample (11%) serves to further elucidate the reality that the supposed 'democratization' of music-making ushered in by the DAW has not actually occurred. Because race and gender are gargantuan topics both deserving of monograph-length discussions in this regard, I have delimited the proceeding discussion to focus only on gender. However, it is my position that there are parallels between the dominance of whiteness and masculinity as they relate to the practice of playing the studio and that the crux of this imbalance on both fronts is the hegemony of white male recording culture.

The gender gap

The glaring disparity between men (89%) and women (11%) who engage in home recording is striking, but the results of previous studies on women working in the field of audio production are consistent with my findings. Sanders (1993) found only 5% of 117 audio engineers surveyed in New York, Los Angeles and Nashville were women. Walsh (1996) found only 4% of 73 American recording technology educators were female. More recently, Tough (2009) surveyed 50 professionals in the field (engineers and producers) of whom only 11% were women. Terri Winston, founder of the San Francisco-based not-for-profit organization, Women's Audio Mission, relates:

> Unfortunately, there is not a lot of statistical information – mainly because the number is so very small. We say less than 5% but we think it is worse than that, especially outside of an academic environment. It's pretty easy to prove: look at a wide shot of any audio convention or try to find a woman credit on an album.
>
> (as cited in Chelsea-Seifert 2011: n.p.)

Based on her interviews of 25 female and nineteen male sound engineers, ages 18–59, identified as predominantly 'European New Zealanders', Smith made the following conclusions that are worth quoting at length:

> A variety of sexist practices dissuade women from becoming sound engineers. They are routinely discriminated against at the recruitment stage: female contenders are regularly passed over, even for unpaid on-the-job training opportunities, in favour of male applicants. Women who venture into sound from the alternative route of formal education find themselves a minority in the classroom with few, if any, female teachers to look to as role models or mentors […] If the budding woman sound engineer is resilient enough to persist past these impediments to graduation, she enters an insecure job market where those studios and sound companies that might benefit from her training will more than likely be dismissive of it […] Upon entering formal employment as a sound engineer, a woman will usually encounter hostility from fellow sound engineers but also from musicians, producers and audiences …

Institutionalised discrimination is also apparent when sound engineer-
ing is incompatible with family demands – and the majority of it is. Late
nights, long shifts and touring rule out tending to home and family,
responsibilities that women continue to shoulder disproportionately.
Unless they work as a freelancer from a home recording studio, women
are disadvantaged relative to men when they have a family.

(2009: 311–12)

While Smith's research highlights the institutionalized discrimination present
in recording subculture, suggestions of a more subtle form of discrimination –
characteristic of 'masculine domination' (Bourdieu 2001) – have surfaced in
interviews with female sound engineers, including Sylvia Massy (Tool, System
of a Down and Johnny Cash):

When I first got into the business, I thought, well, maybe there's some kind
of unfairness as far as men versus women in the business […] that is not
the case. It's that women biologically have other things to do, and by the
time their career really gets going, it's time to think about other things!

(as cited in Massey 2000: 295)

Almost a decade later, Trina Shoemaker, the first woman to win a Grammy
for Best Engineered Album, echoed this stark reality:

For a woman, you absolutely cannot try to start a family in your twen-
ties, and possibly not for most of your thirties. You have to accept that
you're going to be alone for 10 or 15 years, and you may miss out on
ever being married or having children as a result of that. Your male
counterparts are not going to have to deal with that.

(as cited in Massey 2009: 261)

Massy and Shoemaker both portray a grim picture of the field of audio engi-
neering, suggesting that women have to choose between pursuing their
career and having children. Bourdieu frames such perceptions as the result
of acts of 'symbolic violence', 'imperceptible and invisible even to its victims'
(2001: 1); such deeply engrained perceptions go unquestioned and uncon-
tested, adhered to as 'objective' or 'natural' by both the dominant and domi-
nated in a society:

The biological difference between the sexes, i.e. between the male and
female bodies, and, in particular, the anatomical difference between the
sex organs, can thus appear as the natural justification of the socially
constructed difference between the genders, and in particular of the
social division of labour.

(2001: 11)

As Schmidt Horning details, the stems of separation of women from technol-
ogy in general can be traced back at least to the industrial revolution, which
persist to the present and by extension to the development of the audio engi-
neering profession throughout the twentieth century:

The field of audio engineering and recording studios in particular
historically has comprised a profoundly male-centred culture. This is

> … due to the fact that the first operators of recording machines were often machinists or mechanical engineers, both also male-dominated professions. This male dominance continued through the generation of World War II veterans who built the recording studios of the post-war period.
>
> (2004: 726)

Referring to 'adolescent activities that lead to an interest in professional audio', Peterson concluded: 'How many adolescent girls are encouraged to take up these kinds of hobbies and activities? Very, very few' (1980: 2). In contrast, historically boys and men have continually been encouraged to engage with technology. Remarking on Les Paul's contributions to the development of both recording and the electric guitar, Waksman contextualizes Paul's actions: 'They were but one manifestation of a much broader phenomenon, the growth of technological enthusiasm and electric tinkering among white middle-class boys and young men in the early decades of the twentieth century' (1999: 41). Mid-twentieth-century publications on recording technology assumed a male audience as evidenced by the language employed in Charles D. Sigsbee's article 'How to record your voice': 'Telling you how to use microphones in recording the voice is something like preparing a manual on "The Care and Management of Wives"; different types require different treatment under different circumstances' (1953: 13). Sterne and Rodgers affirm that the boy-biased culture of technology has not changed markedly since: 'music technology magazines and advertisements address a community of readers that is assumed to be largely young and male, and these publications routinely associate electronic music machines with seductive, female sexuality' (2011: 37).

Considering this male-centred legacy of recording technologies, it should come as no surprise that these attitudes are not just manifested in professional and recreational music-making contexts, but in school settings too. For example, in a London-area school, Armstrong surveyed 41 young women and 42 young men, aged 15–18, and posed the question, 'Do you feel confident using music technology for composing?'. She found that 90 per cent of the young men responded 'yes', while only 48 per cent of the young women answered 'yes' (2008: 381). Despite the fact that women researchers have continually been innovators in integrating technology in music education, especially with regard to composition (e.g., Bamberger 1977; Hickey 1997; Stauffer 2001), the end users of these music technologies continue to be predominantly males. This regrettable reality is consistent with Bourdieu's theory of 'masculine domination':

> Girls internalize, in the form of schemes of perception and appreciation not readily accessible to consciousness, the principles of the dominant vision which lead them to find the social order, such as it is, normal or even natural and in a sense to anticipate their destiny, refusing the courses or careers from which they are anyway excluded and rushing towards those for which they are in any case destined. The constancy of habitus that results from this is thus one of the most important factors in the relative constancy of the structure of the sexual division of labour.
>
> (2001: 95)

In summary, this is an issue that extends beyond schooling; it is systemic in society at large in all facets of the technology industry. The underrepresentation of women in the role of playing the studio is consistent with the history of recording studio culture, which has a long-standing lineage of being operated almost exclusively by men.

Designing as music education

In the college-level music technology classes that I teach, students often lament, 'I'm horrible with technology', and then look down at the screens of their smartphones as they thumb through their messages. Despite being adept with complex technologies outside of the musical sphere, they perceive 'music technology' as a daunting domain. Music-making software applications such as DAWs are assumed to be inherently involved. Armstrong (2011) posits that music-making software presumed to be 'difficult' is perceived as 'masculine', whereas software experienced as 'easy' tends to be characterized as 'feminine'. If we can accept the premise that music technologies are not just tools, but rather instruments to be played as 'amplifiers of musicality' (Brown 2015), then Armstrong's assertion about the gendering of music technologies is consistent with the gendering of musical instruments in general (e.g., Abeles and Porter 1978; Griswold and Chroback 1981; Delzell and Leppla 1992; Fortney et al. 1993; Zervoudakes and Tanur 1994; Green 1997; Sinsel et al. 1997; Johnson and Stewart 2004, 2005; Abeles 2009; Smith 2013).

All musical instruments – bodily, mechanical, electric, electronic or otherwise – are subject to our social constructions of gender. In addition to the cultures created around existing instruments, we also need to be mindful of the cultures creating new technologies/instruments. According to the National Center for Women and Information Technology (2015), despite the fact that women comprise 57% of the US workforce, just 26% of these jobs are in computing and the stake of racial minorities in this sector is grossly underrepresented with Asian women, African American women and Hispanic women constituting just 5%, 3% and 1% of these occupations, respectively. Thus, we can safely assume that more often than not, women, especially minority women, have little involvement in the development and refinement of DAWs and other computer-based music-making technologies. This is especially important considering that most modern musics are heavily DAW-dependent. Consider the case of EDM, which has the word 'electronic' embedded into its label; EDM cannot be made without music technology because the technology is the instrument of the EDM musician. DAWs tend to be predisposed to specific musics: 'the outcomes of specific systems are influenced by the designer's cognitive or physical preferences and understandings. When we choose a piece of music software, or other technology, we are essentially deciding, in part, whether or not our priorities align with those of the designer' (Brown 2015: 17).

Whereas most mechanical instruments have either ceased to evolve or are now evolving so slowly that any new developments require little adaptation on the part of the musician, computer-based music technologies change constantly to adapt to the musicians' demands. Music educators can take advantage of this iterative nature of technological design. Rather than wait for technologies to be developed and deployed to classroom and community-learning contexts where the music educator is forced into a losing battle

against de-gendering the masculine/feminine binary implicit in software and hardware, educators and students alike need to infiltrate the design process and be active agents in the development of the technologies they will use to make music (Alex Ruthmann, personal communication, 14 December 2014).

CONCLUSION

To dispel the deep-seated defeatist attitudes towards music technologies, which germinate into self-fulfilling prophecies of failure, the complex roots of this problem that entwine some groups of people more than others cannot be weeded out by simply improving the infrastructure to access technology: 'problems that include social barriers, subtle hurdles that look more like glass ceilings than impassable divides, and the dearth of content that reflects the experiences of all potential users' (Hines et al. 2001: 1–2). As Armstrong concludes, 'Gender equity […] comes through an awareness of how language, behaviour, values, organizational issues, texts, music software and knowledge all contribute to the shaping of gendered meanings that enter into our classroom practices and reproduce normative gendered expectations' (2011: 136). We need to 'move beyond the two poles of high-tech extremism – technophilia and technophobia – to more realistically assess lived experience in an increasingly technological world' (Hines et al. 2001: 2), and we need to be agents in the design process. The music educator needs to foster a culture in which learners go beyond simply using music technologies and retroactively navigating their pre-programmed biases to avoid perpetuating a simplistic user mentality. Instead, music educators must engage their students in activities of iterative technological tinkering that nurture a design mentality. Then, not only will we play the studio, but we will design it too.

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APPENDIX A – SURVEY ITEMS

1. What is your age?

2. What is your gender?

   • Male
   • Female

3. What is your race?

   • White/Caucasian
   • African American
   • Hispanic
   • Asian
   • Native American
   • Pacific Islander
   • Other

4. In which New York borough do you live?

   • Manhattan
   • Brooklyn
   • The Bronx
   • Queens
   • Staten Island

5. In which industry are you employed?

   • Forestry, fishing, hunting or agriculture support
   • Mining
   • Utilities

- Construction
- Manufacturing
- Wholesale trade
- Retail trade
- Transportation or warehousing
- Information
- Finance or insurance
- Real estate or rental and leasing
- Professional, scientific or technical services
- Management of companies or enterprises
- Admin, support, waste management or remediation services Educational services
- Health care or social assistance
- Arts, entertainment or recreation
- Accommodation or food services
- Other services (except public administration)
- Unclassified establishments
- Other

6. Do you make (compose) and record your own music?

- Yes
- No

7. Please list any instruments you play and the number of years you have played them.

8. Have you studied music performance at the college level, at a conservatory, or privately with a teacher? (e.g., taken lessons to learn how to play a musical instrument or sing)?

- Yes
- No

9. How many years total have you studied music privately, at a college, or at a conservatory?

10. If you play musical instruments, please list each instrument (including voice) and rank your skills accordingly (1 is low, 10 is high):

11. Rank your overall level of musical training from 1 (no musical training) to 10 (professional):

12a. Do you play in a band or a group?

- Yes
- No

12b. How many years have you played in a band or a group?

13a. Does making music contribute to your income?

- Yes
- No

13b. Approximately what percentage does making music contribute to your income?

14. Do you have formal training in audio engineering or music production? (e.g., did you attend college to study music technology or participate in an apprenticeship?)

- Yes
- No

15. How long have you been making and recording music?

16. Approximately how many songs or pieces have you recorded?

17. How would you classify or describe the type of music you make? (e.g., rock, rap, jazz, classical, etc.)

18a. Do you use one of the following to record your music: Desktop, Laptop, Tablet (e.g., iPad)?

- Yes
- No
- Please specify:

18b. PC or Mac?

- PC
- Mac
- Tablet (iOS/Android/Windows)
- Other

19. What recording software do you typically use to record and make your music?

20. Do you use an external sound card (audio interface):

- Yes
- No

SUGGESTED CITATION

CONTRIBUTOR DETAILS

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