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RETHINKING MUSIC TECHNOLOGY PEDAGOGY: A NEW ZEALAND FOCUS

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Abstract

In the creative sector, "music technology" refers to a wide range of musical practices, tools and devices enabled or facilitated by computers. Yet the music technology curriculum in New Zealand, as in other parts of the world, is dominated by two specific tools: commercial Digital Audio Workstations (DAWs) and notation software. In this chapter, I problematise this limitation by showing the pedagogical issues deriving from this exclusive model and by unpacking the ideological substrate of these tools, which is firmly grounded on neoliberal practices and principles. My analysis covers the ontology of these tools—what they are, what they do—and their business model. I then compare these tools against alternative approaches to music technology based on free-to-use, open-source software and programming languages based on principles of inclusion, collaboration and creative exploration.

Keywords

Open-source pedagogy; neo-colonialism; politics of music technology; DAW

Introduction

Music technology is an umbrella term that comprises various computer tools (software and hardware) used to compose, produce and perform music. Some of the most common of these tools and practices are digital audio workstations (DAWs); notation software; programming languages for sound design, algorithmic composition and live coding; modular synthesisers; interactive and audiovisual installations; circuit bending; and embedded hardware for music instrument design. Despite this wide range of tools, most pre-tertiary and tertiary music technology courses in New Zealand are limited to teaching students how to use DAWs and notation software.[i] DAWs are the most widespread software for modern music production, as they generally package in a single solution all that is needed for the various phases of production: recording, editing, mixing and mastering. Their success is also linked to the idiomatic composition techniques available in DAWs, particularly sampling and looping, and to their seamless integration with MIDI devices, audio plugins and sound libraries that allow one to easily manipulate acoustic components of the song being produced. Notation software is a necessary tool for classical composers and performers, as they are de facto *augmented* scores, i.e., surrogates, with added functionalities or paper-based scores. These two tools are thus originally designed to be used by a subset of musicians—producers and composers—and to create or support the creation of specific musical aesthetics.

The dominance of these two specific tools in music technology syllabi is problematic, as they influence students' expectations of what music technology is or should be. The aim of this chapter is to initiate a long overdue discussion about the narrowness of our offering in the field. If we fail to engage in this discussion, we implicitly support the current one-sided view of the field.

I will leverage this narrowness to introduce a more far-reaching and problematic aspect of our music technology curriculum: the closed-source, commercial nature of (most) DAWs and notation software commonly taught in schools and universities. Closed-source software[ii] is for-profit proprietary (commercially licensed and protected) computer programs based on a centralised model. Users interact with the software via an interface but cannot access the underlying code, in which the functionalities of the program are inscribed.

An alternative model is offered by open-source software. As opposed to closed software, the underlying code is open: anyone can access it. Importantly, open-source is not only a matter of *access* but also of *contribution*. Its model is decentralised; thus, anyone who has coding experience can indeed contribute to improving the code or create derivative versions (technically, a separate instance or *fork*). In most cases, open-source solutions are completely free. The most commonly used open-source music technology tools are programming languages such as SuperCollider and PureData. However, it must be noted that closed vs open-source does not equal DAWs vs coding. There exist open-source DAWs (e.g., Reaper and Ardour) and notation software (e.g., MuseScore), just as there exist closed-source music programming environments (e.g., Max, ChucK, and [in part] Juce).

The politics of access

The first problematic aspect of music technology tools that follow a closed-source model is the high cost, either lump sum or subscription. The cost of these commercial tools raises clear inclusivity issues, as it fosters a socially inequitable model that grants access to creative tools on a classist basis. In addition to the purchase or subscription cost themselves, these tools usually require their users to periodically update their machines to the latest versions of the operative system, which, in turn, forces users to upgrade or replace the machine every few years. Notably, these costs are not only absorbed by private users or students, but also educational institutions, which are expected to offer students these expensive commercial tools under the current model, and thus need to purchase hundreds of licences every year. In the case of public institutions, this typical neoliberal flow of money from the public to the private is particularly problematic as taxpayers' money effectively subsidises commercial companies. Furthermore, once they have left their institution, students who learn to use specific commercial tools and plugins probably end up needing to purchase these tools unless they decide to obtain them in illegal ways.

An additional access issue is connected to the nature of modern DAWs, which comes from the inherent computational and storage cost of plugins, sample packs and sound libraries. These tools require a massive amount of storage space and an ever-increasing computational power to work, thus demanding new hardware purchases.

Open-source music technology tools, by contrast, are free to use, as they are based on a decentralised model of peer-production, where tools are supported and developed by a community of volunteers. It might be argued that these tools are not as powerful as commercial tools. However, open-source audio programming languages, like Supercollider and Pure Data, have potentially illimited possibilities regarding what sounds or music can be created, as they are Turing-complete (McPherson & Tahıroğlu, 2020). Furthermore, the required storage space is also minimal compared to DAWs. For example, as of the end of 2021, a complete installation of SuperCollider is 253Mb, whereas Logic Pro requires 72Gb for the software plus the full Sound Library—284 times bigger.

Of relevance to this theme are the antithetical positions of closed- and open-source solutions when it comes to allowing access to the underlying functionalities of the tools. When learning to use closed-source DAWs, students learn specific and discrete functionalities. For instance, they learn to use a (very expensive) plugin to add reverb to a track and change some of its parameters (e.g., room size, damping, decay time). However, with the code being inaccessible, they can only change the parameters made available by the company as their underlying functionalities—mostly equations—that are at the basis of all these tools are inaccessible.

This obscurantist practice renders commercial tools take-it-or-leave-it, impenetrable black boxes. Students can't look under their hood and learn how they work. They can learn how to interact with the tool, but this knowledge is software-specific and can transfer to other programs only to a limited degree. The functionalities pre-packaged by the company thus limit creative exploration. For instance, in the case of DAWs, students' experience is limited to learning how to select loops, samples and effects within a finite list of available options. The range of what is creatively possible is thus bounded by the

list of available functionalities, which end up shaping the creative process. Closed-source music technologies thus channel the creative process along predefined tracks, thereby standardising musical outcomes.

Open-source tools allow everyone to freely look under the hood, learn how the system works and potentially even modify the code. Thus, when students gain enough confidence, they can re-write part of the code, invent new functionalities and enjoy virtually infinite customisation. Musical practice thus becomes a genuinely exploratory, open-ended activity. The pedagogical consequences are enormous. First, students can access the code and the underlying algorithms and learn precisely how these work. This knowledge is not bound to any specific tool but can be generalised and transferred when learning new tools and programming languages. Second, students learn to tweak their tools as they wish, even appropriating them for purposes other than what the developer initially intended (Masu & Morreale, 2021). Enabled to tweak the code to their liking, anyone can create their own sound/effect tailored to their practice.

The very ontology of the student evolves from being *users* to being *creators*—from having their creative practice shaped by the tool to literally shaping the tool. Students thus learn to relate to technology as something that can be used and misused to the extent that is needed, rather than being limited and influenced by the constraints embedded in all closed software solutions. By accessing the underlying code, students learn to relate to technology not as a take-it-or-leave-it closed box but rather as something that can and should be analysed, critiqued and challenged. Developing the ability to critically reflect on the implications of, and relationships between, technology and music, students develop a critical lens they can apply to the impact of using technology in general.

Ideological underpinnings

As tools of cultural production and cultural symbols, tools for making music are inherently political (Morreale et al., 2020) despite IT companies conveniently labelling creative tools and technologies as inherently neutral. This alleged neutrality frees them to avoid engaging with ethical matters, which are considered the remit of moral philosophers. This argument has been dismantled by several scholars in philosophy and social science (Ihde, 1990; Keyes et al., 2019; Verbeek, 2005).

Technology is not neutral; the tools we use instantiate implicit or explicit aesthetic, cultural, social and political ideologies. Commercial music technology tools are indeed firmly and unequivocally linked to a specific political substrate, which can be identified by the recent interest of capitalist firms in cutting-edge music technology companies (Morreale, 2021). Sterne and Razlogova (2021) recognise that this trend shows that the political affiliation of new music technology tools are "just the latest chapter in a long story of capitalism failing to fully account for culture" (p. 16).

An archetypal example of the capitalist drift of music technology companies is offered by the recent coalition (Music Creation Group) formed between the music technology companies Native Instruments and iZotope (Francisco Partners, 2021a). This coalition was made possible by the influx of capital from the private equity firms EMH Partners and Francisco Partners. Francisco Partners framed their investment as an effort to "democratise music production" (Francisco Partners, 2021b). Leaving aside the fallacy of the vision about democratising music creation, which I have already exposed with some colleagues (see Morreale et al., 2020), this vision becomes problematic when considered against another statement released by the investors: "With Francisco Partners, Native Instruments is planning to … drive consolidation in the growing and fragmented market for digital music creation" (Franscico Partners, 2021b). The narrative goes like this: a fragmented music creation industry is a problem that can be solved by creating an end-to-end, music creation platform. This typical techno-solutionist narrative (Morozov, 2013) considers musical ability an issue, something that must be addressed with technology (Morreale et al., 2020). In 2017, Native Instruments had already received €50 million investments to "unlock the future of music creation" (Synthopia, 2017) as if musical creativity was a deficit that needed to be remedied by some technological solution.

The Native Instrument is not an isolated case in the gold rush to create a monopolistic, end-to-end music platform. Spotify, the hyper-capitalistic, publicly listed music company leader in the music consumption sector, owns the browser-based DAW Soundtrap and is developing tools to help artists optimise their songs with the help of AI (Morreale, 2021). Their mission is clear: from the conception to the release, Spotify is the only ecosystem you need. Creating the end-to-end, music technology ecosystem is an attempt to restrain and fence a vibrant, complex and multifaceted environment into a homogenised space. This attempt can be framed borrowing theoretical lenses from Glitch Feminism (Russell, 2020): creative approaches to music technology are not welcomed by capitalist firms as they are difficult to frame, commodify and advertise.

The alternative model is offered by non-commercial open-source tools. Linked to the hacker movement of the sixties, this model endorses open and modifiable solutions to support playfulness and exploration. This model challenges the status quo of the homogenous consumer front and reflects the cyberfeminist endeavour of opposing boxed approaches and welcoming in the "differences and spaces in-between" (Russell, 2020, p. 25). Peer-to-peer (P2P) sharing, which is at the core of the open-source movement, can be thought of as the exact opposite of this crusade to close and standardise music technology. P2P leverages people's intrinsic motivations to collaborate and foster common values through joint effort (Masu & Morreale 2021). When working with open-source software and hardware, students are exposed to communities that resist capitalist models, economies of scale, mass production, private property, copyrights and patents. Open source finally offers the socio-technical infrastructure needed to encourage peer-to-peer knowledge sharing among musicians, who can redistribute copies of their modified versions to others, thereby building a sense of community.

Idiomaticity and neo-colonialism

Musical instruments have idiomatic characteristics—i.e., music passages, interaction patterns or compositional styles that are easier or more intuitive to perform—and music technology tools are no different. As explained by McPherson and Tahıroğlu (2020), when comparing various computer-based tools for music creation, "the design of any tool favours certain types of thinking, certain modes of interaction, certain outcomes over others" (p. 53). Music instruments, indeed, do not passively transmit human expressiveness, but they interfere with the creation process by enabling and constraining performers to act in a certain way (Jordà Puig, 2005; Gurevich & Treviño, 2007).

Magnusson (2009) and McPherson and Tahıroğlu (2020) discussed the idiomatic aspects of DAWs and the MIDI-ecosystem and stressed the centrality of the equal-tempered scales and standard time signatures (mostly 4/4). These aspects are firmly centred on Western conception and values of music, thus successfully exporting the supremacy of Western music hegemony from Western classical music to modern genres like Electronic and Hip-hop. This instance in which software becomes normative is another example of standardisation. Despite everything being possible, and despite the slogan that "you can create any sound", IT companies purposely facilitate specific software uses and discourage, or bluntly impede, *unwanted* uses. Consequently, these companies end up influencing how users adopt the interface (Morreale & Eriksson, 2020; Stanfill, 2015). The widespread dissemination of these technologies radically influenced non-Western popular music, thus sustaining a white racial framing of music (Ewell, 2021). Fortunately, some DAWs have been recently developed centred on non-Western tonal systems and idiosyncratic aspects (the most notable example being Khyam Allami's Apotome and Leimma).

Sampling, one of the most commonly used DAW techniques, is another feature that has evident traits of neo-colonialism. Simply put, sampling is about using and often manipulating existing recordings in new compositions. These recordings might be recorded by the artist or purchased from commercial sound packages. However, the original sounds are usually harvested from sources without consultation or proper acknowledgement. The fact that "everyone does it" cannot justify us overlooking engaging with students the problematic aspects of this practice. This practice is indeed another example of modern-day colonialism, where everything can be possessed, exploited, occupied and eventually

commodified. (For deeper discussions on the political costs of sampling, see Franklin, 2021.) Decolonising the music technology space also involves rethinking the Western consumeristic imaginary of technological innovation, central in music technology. Commercial DAWs, plugins and MIDI controllers are constantly updated with every new version, offering incremental changes that are often negligible yet marketed as necessary. This consumeristic drive for constantly upgrading is problematic in many ways, from the environmental cost of the constant creation of electronic waste to labour exploitation in technological space.

Addressing these issues in the classroom

In this section, I offer three suggestions for teachers who are interested in incorporating alternative models in their music technology courses.

1. **Broaden the spectrum of our music technology offerings:** When selecting tools and teaching material for the school curriculum, we act as knowledge gatekeepers, and we have the honour and burden of influencing students' creative outcomes. We show them that some of these tools are more important than others and—possibly more significantly—that the music they can make with these tools is more important. We are thus helping them imagine what sort of music they can make with computers and how computers can be used to make music. Thus, it is of paramount importance to broaden our offering in music technology, which is currently limited to DAWs and notation software, and include other forms of computer music. Obviously, this expansion would require teachers to educate themselves on these other technologies in the first place.

2. **Ditch commercial software:** In Aotearoa, as elsewhere, music technology classrooms are currently dominated by a handful of highly influential private companies. While these companies clearly benefit from recruiting future users at an early stage and being recognised as the go-to solution for music technology, it is not clear how students themselves benefit from being taught how to use specific commercial software. It might be argued that music studios expect music graduates to master specific commercial tools like Pro Tools or Logic Pro. This expectation is aligned with typical capitalist views of education, which should "produce and reproduce a work force and citizenry and set of consumers fit for Capital" (Hill, 2010, p. 16). As music technology teachers, we have the power to frustrate this expectation. Besides this ideological reason, in practical terms the few students who will indeed end up working in music studios will be able to learn how to use commercial software in no time if their preparation is solid and grounded on generalisable concepts.

3. **Stimulate a critical approach to technology:** I invite colleagues to design coursework material and activities that are aimed at stimulating students to critically understand the complex relationship between technology and musical choice. Discuss with students the exploitative nature of sampling, reflect on instances in which computer tools can indeed be beneficial to musicians and instances in which they lead to musician redundancy (Morreale, 2021), and present them with alternative perspectives to proprietary tools, which defy economies of scale and mass production, and private property copyrights (Masu & Morreale, 2021).

Discussion

In this chapter, I problematised an industry-pleasing music technology curriculum in which students are taught how to use a specific category of commercial music software. As I argued, this model more or less unwittingly traps students in the use of this form of software. It is urgent that we address the political consequences of this model, start truthful conversations about our role as teachers in this context and incorporate alternative pedagogies in music technology courses.

The arguments that I have set out in this article can be taxed with quixotism, excessive reliance on ideology and impracticality. In the end, it might be argued, students that will be hired by professional music studios will be expected to be able to proficiently use specific commercial software. I argue, however, that learning to use specific software should be the remit of professional training courses. Rather, pre-tertiary and tertiary courses in music technology should instead have a holistic approach to the discipline, based on a variety of tools that differ from the current *DAW monoculture* based on commercial software that imposes normative use that results in the creation of specific music in specific styles.

My aim in this article was to demonstrate that alternative models of music technology are possible—models that are anti-capitalist and anti-colonialist and are based on collaboration, sharing and de-standardisation. I argue that Aotearoa could be the perfect starting point to rethink music technology pedagogy, given the increased commitment in the country to developing decolonising methodologies and pedagogies. Learning music technology is not about being users of commercial software but about seeing beyond the boundaries of the present, to the creation of new musical interactions, vocabularies and possibilities. This is my view about the role of music technology in the music curriculum: an unconstrained playground for students. What student profile are we contributing to shaping if we fail to address this matter?

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[i] https://www.nzqa.govt.nz/framework/explore/domain.do?frameworkId=75936

[ii] Hardware can also be closed- and open-source, but for the matters of this manuscript I will only focus on software. Readers interested in open-source music technology hardware can refer to Morreale et al., 2017.