STUDIO REPORT:
MUSIC TECHNOLOGY AT PENN STATE UNIVERSITY

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ABSTRACT

Music technology is a relatively new presence at Penn State University, with a gradual introduction of courses having begun in 2001. These courses led to the establishment of a Music Technology Minor in 2006 [1], which enjoys a robust interest among students from Music and other majors. Some 5-15 students declare candidacy for it each semester. This has caught the attention of higher administration, which has committed significant one-time capital upgrade funds to construct an acoustically-treated recording studio. There are also ongoing explorations about expanding curricular options, possibly in collaboration with international universities. Our main strength is in providing foundational principles for undergraduate training. To be sure, Penn State does not lie within the same echelon as schools that offer degree programs and/or a strong research presence, but we expect that to change. There are various challenges to growing a program from scratch, which are no doubt relevant to the circumstances of other schools that have established music programs, but no history and possibly little awareness of music technology as a no-longer-emerging field.

1. PEOPLE

The two authors of this paper are the administrators of Penn State's Music Technology Minor. The complete set of courses applicable to the minor, however, represent a range of associations forged with faculty in other programs, which include Composition, Visual Arts, Acoustics, Electrical Engineering, and Information Sciences and Technology. Two graduate assistants, one half time and one quarter time, are funded on a consistent basis, with the half-time position including lab maintenance duties, and typically (though not always) filled by a graduate student in Composition.

2. COURSES

Music technology at Penn State was not begun by a high-level initiative with a stimulus of funding, staff, and a degree program. Rather, it has taken root slowly through the establishment of a series of courses that cover a core curriculum

In the year 2000, the music technology curriculum consisted of two classes created in the late 1980s: one class in electronic music composition and an independent studio project. At that time, an upcoming accreditation review by the National Association of Schools of Music (NASM) foretold a need for technology training in relevant technologies for all, which led to the hire of a faculty position in music technology. At about the same time, the School of Theatre established a faculty line in sound design.

It was not immediately clear exactly what type of training should be provided for Music students.[1] Complicating matters further was the fact that "music technology" means different things to different groups of people. To verify this, one need only compare Dodge and Jerse's *Computer Music* [2] with Webster and Williams' *Experiencing Music Technology* [3] to discover two entirely different sets of goals and assumptions about computers, audio technology, and music.[2]

The first step was to establish a course in digital audio and MIDI [4], wherein students gained fluency with sequencing and notation programs, and to require it for all students majoring in Music. According to administrative logic that is well beyond the scope of this document, this course is not offered by the School of Music for its majors. Rather, it is classified as a General Education Arts course, and offered by the Department of Integrative Arts. This makes it available to all Penn State undergraduate students,

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[1] The current NASM standards stipulate that "students must acquire the ability to use technologies current to their area of specialization" leaving it largely up to each institution to define what these abilities should be.

[2] Here's an anecdote I can't resist including: when my own textbook's publisher was collecting editorial reviews of the book, there was one reviewer who strongly objected to the amount of coverage I gave to audio recording—this was a topic apparently not within the purview of music technology, as shown by the fact that it was not a topic covered in the then-current version of the Webster/Williams book. [M.B.]

all of whom are required to complete a certain number of credits in the General Education Arts category.

Music technology at Penn State finds itself in a situation often experienced by departments of music theory in that it must serve dual roles: one as a service provider to a large and general student population, and another as an area for research and creative activity for students wishing to specialize in it. While on paper it sounds attractive to require that all Music majors take a course in audio/MIDI/music production, in practice such a requirement turns out to be a mixed blessing. While students from other majors often approach the course with great enthusiasm, Music majors often find it particularly burdensome. The challenge has been to balance the needs of students requiring only a broad introduction to the area with the needs of those wishing to gain vocational proficiency in it.

In fairness, topics such as comb filtering or bussing audio to an auxiliary track may indeed be needlessly arcane to a student whose vocational goal is to conduct middle school choirs or bands, and whose credit load is well above the norm due to state-mandated teacher certification requirements. (The ever-shifting nature of these requirements also seems to be a constant stress factor.) Such topics, standard fare for computer music composition courses, are well beyond what is required by NASM.

Therefore, updates to this course are frequent as technology evolves, and the needs of musicians and educators change. Two significant updates are appearing in the 2009-10 academic year.

One was to convert the course to a Web-only offering. Some years earlier, when the class was initiated, we received many questions about its suitability for online delivery, typically from well-meaning administrators who confused a class about working with technology for a class that could be delivered effectively with technology. At the time, the idea was impractical due to the amount of hardware and software that students would have needed. Over time, however, it has become the norm for students to equip themselves with laptops[3]; and many choose to purchase academically-priced music production software (which is also available in campus supported computer labs). Thus, it has become feasible, and ultimately more sensible, to offer the course online.

While the online format lacks the inherent personal touch of traditional face-to-face instruction, it also offers a more effective means of delivering nuts and bolts tutorials on software use and assignment instructions. Tutorial videos may be downloaded or viewed online at iTunesU, making them far more accessible than an in-class demonstration. Of course, in real life events do not always unfold as smoothly as they do on video tutorials. Students

are admonished to seek in-person help as needed with inevitable computer troubleshooting. Arranging for the lab to be regularly staffed by instructors and course assistants accommodates students who are more comfortable with face time instruction.

Another update was to concede that the same course was simply not compatible for specialists and generalists, and thus it was split into two sections, one at a lower credit level (one instead of three) and available to Music majors. The three-credit version continues to train students to use professional level programs (on the order of Digital Performer or Logic), and requires students to create in-depth projects, submitted on CD. The one-credit version trains students to use consumer-level (though still potentially powerful) software such as GarageBand, and requires that they submit fewer (and less in-depth) projects online as podcasts. Graders access the podcasts via subscriptions at the iTunes Music Store. The assignment of creating a podcast space and uploading material that is publicly available is meant to provide an immediately tangible skill for aspiring performers and educators.

This sequencing course was but the first of a series of courses to be created. A course in the history of electroacoustic music has been described elsewhere [5, 6]. This course utilizes an on-line text [7] that has the distinction of having caused something of a dust-up on the Canadian Electroacoustic Community list in the winter of 2009 when it was presented as an available resource.

Another course created at the same time in musical acoustics [8] is classified as General Education Natural Science (something of a distinction for a course offered by the College of Arts and Architecture). Other courses subsequently created include an introduction to theatrical sound design[4], audio recording[5], and music programming[6] (typically in Max/MSP or SuperCollider).

3. MUSIC TECHNOLOGY MINOR

The Music Technology Minor is a 21-credit minor (though it is effectively an 18-credit minor for students who have a musical background, and thus can waive a course in music rudiments). It consists of four prescribed courses: science of music, fundamentals of MIDI & digital audio, introduction to theatre sound design, and audio recording[7]. Students supplement this core with at least two Supporting & Related Courses, which allow them to focus in a direction suitable for them. Many of these courses are offered by other units, such as Electrical Engineering, Acoustics, Communications, Computer Science, or Information Sciences and Technology. Topics covered in these courses include loudspeaker and amplifier design,

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[3] Penn State Music majors are currently not required to purchase laptops, though some think such a requirement is inevitable.

[4] THEA 285 Introduction to Sound Design
[5] THEA 484 Sound Recording Techniques
[6] MUSIC 451 Software Programming for Musicians
[7] INART 50, INART 258, THEA 285, THEA 484

design of convolution reverbs, or media and law. The breadth of offerings at a university the size of Penn State means that applicable courses to this requirement are created with some frequency.

As courses applied to a minor may double-count with courses for a major, students may use the minor as a complement to their major field of study without increasing their credit count. As an example, the College of Information Sciences and Technology began offering a Bachelor of Arts degree in the Fall 2009 semester. As opposed to their Bachelor of Science degree, the BA is meant to include a creative focus of some kind, and has a large elective category. Students are presented with a number of possible "tracks." One example track they are given focuses in digital music, and involves taking courses that lead to the completion of the Music Technology Minor.

On this campus at least, minors are becoming something of a buzzword. On the one hand, a minor is nothing more than an optional series of courses that amount to an extra line of text on a student's transcript, a kind of merit badge in an adjunct area. Therefore, the only reason to complete a minor should be that one is interested in taking the courses, with or without any kind of certification or recognition. However, this is not equally true for all majors. With a challenging economy facing them on graduation, students are eager to distinguish themselves, and minors are becoming an increasingly common way to individualize their credentials. (A "textbook" case described to us is that a Psychology major with a minor in Early Child Development looks very different on a resume than a Psychology major with a minor in Accounting or in Statistics.) Therefore, it is understandable that a minor in music technology could be a valuable complement to degrees in a variety of fields. Past majors of students completing the minor include Music, Information Sciences and Technology, Electrical Engineering, Theatre Sound Design, and Journalism.

4. FACILITIES

The School of Music has four rooms created for audio production. A central room (Studio B) is connected by windows and cable ducts to three other rooms: a large room approximately 15 x 50 ft. (Studio A), a small sound booth (Studio C), and a project room approximately 10 ft. x 15 ft (Studio D). Studio A has served as a computer lab, seating 16 student workstations and one instructor station with a projection system. With the imminent availability of comparable space in the neighboring building (housed by the School of Theatre), the computer lab will be relocated and Studio A will be converted into a recording studio.

The renovation required will be extensive. Although the walls are treated for sound, the room will still require the installation of acoustically sealed doors, a dividing wall that will subdivide the space into a recording room and a tracking room; a new floor, walls and ceiling for the tracking room to ensure acoustic isolation; and the accompanying modifications to the lighting, electrical, and ventilation systems.

A recording studio is far easier to implement when a building is constructed than after the fact. The price tag for a renovation of this scale, done by University-approved contractors and labor, is beyond the budget of a single academic unit. But as a recording studio was cited as a shared priority for the Schools of Music and Theatre, higher administrative levels of the College of Arts and Architecture have provided the funds necessary to greenlight the renovation. Construction is likely to take place during the 2010-11 academic year. The studio will have the advantage of being one of the College's showpiece projects, featured in presentations and progress reports given to the University Board of Trustees, boosters, and other influential groups.

The computer lab is equipped with Apple computers at the iMac or Mini grade. They are replaced every three years through an arrangement with Apple Leasing. Students taking introductory courses may also work in computers labs funded and staffed by Campus Computing. This area has been very helpful in making sure that the music software and basic hardware (sequencers, audio editors, MIDI keyboards and podcast recording workstations) used for these courses are available in campus-wide labs.

The College of Arts and Architecture houses additional smaller project labs for students doing advanced work in music programming, multi-media or theatre sound design, plus a neutral digital research space that seats approximately 75 people. This Digital Research Lab is currently used for an annual electroacoustic music and multi-media concert called Cross Currents. These concerts feature the work of students and faculty, and typically include guest artists. Past guest artists have included Robert Dansby from CalArts; Perry Cook and a group of students from Princeton; Mark Polishook; Robert Rowe, Esther Lamneck, and a group of students from NYU; and Eric Lyon from Queens University Belfast.

5. RESEARCH

Curtis Craig is active in recording and sound design. In addition to designing or supervising audio for 5-10 Penn State productions each academic year, he works regularly in regional theatres. His advanced classes cover the development of theatre technologies and new methodologies of concert recording.

Mark Ballora is a composer and researcher in data sonification. He will spend the 2010-11 academic year on sabbatical, working as a research associate with the Center for Network Cognition and Information Fusion (NC^2IF) [9], a center affiliated with PSU's College of Information Sciences and Technology. The work will involve

developing an experimental course in auditory display and data sonification, and providing an auditory component to a variety of projects concerned with representing complex data.

While Penn State is still an evolving research presence, a number of students have done thesis or honors projects in areas that include: software that analyzes a player's use of tuning and vibrato; a study of the acoustics of the School of Music's auditorium with recommendations for an appropriate sound playback and reinforcement system; writing and recording an album of original music; and an examination of granular synthesis and discussion of major works by Barry Truax. Students who have focused in music technology at Penn State have gone on to do further work at a variety of graduate music technology programs.

6. FUTURE DIRECTIONS

Given the range of course offerings at a university the size of Penn State[8], it seems likely that the makings of a major in music technology are already in place, waiting to be made part of a degree program. The creation of a degree program is probably inevitable, but it will emerge gradually as the necessary roots become established. While many courses are in place at Penn State, there are not quite enough to create a full degree program. Some advanced classes would have to be completed at other universities, coordinated through Penn State's International Studies office. Although this idea is entirely consistent with Penn State's goals of providing an international education, creating a degree program of this nature will take some time to coordinate.

Thus, while the groundwork is being laid for a full degree program, realistically it will take some years before we will be ready to start placing ads for applicants.

7. FUNDAMENTALLY SOUND

An Theatre professor's remark from one of the author's undergraduate years rings true to this day: "Why is it," the professor lamented, "that we bring in the big-name actors to teach advanced acting classes? *Anyone* can teach a scene studies class! Where we really need the masters is in beginning level classes, teaching the fundamentals."

By the same token, when sports commentators are favorably inclined toward Penn State's football team, the Nittany Lions, they frequently praise PSU's emphasis on fundamentals.

Effective instruction in fundamentals seems to be a rare and valuable thing. The fact that music technology at Penn State has taken hold from the ground up, rather than the top down, means that we started by developing

introductory courses, which had to be accessible to the general student population. Thus, it is in keeping not only with our own training, but also with good old Nittany Lion pride, that we can state that our courses probably cover fundamentals as well as anyone does, if not better.

It has been often noted by veterans in the field that computer music has broadened and democratized from a small group of specialists to a medium now as ubiquitous as photography, which was also a medium once inaccessible to any but professional experts. The ease with which advanced DSP can now be carried out on consumer-grade laptops has made digital music accessible and relevant to a variety of fields. Just as content creators of computer music have broadened, at Penn State the curricular offerings in it have similarly broadened and democratized. Its significant at Penn State is not due to it being an area unto itself, but rather to its significant complementary role for other areas of study.

There are many reasons for choosing a university, and, to be sure, Penn State benefits from a carefully crafted brand identity and strong alumni base. Students considering Penn State, for any number of reasons, are increasingly finding added incentive by the possibility of pursuing a Music Technology Minor that can effectively complement some major area of study, and provide the fundamental training that may qualify them for further work in the area after they graduate.

8. REFERENCES

[1] http://www.music.psu.edu/prospective/mustechminor.html

[2] Dodge, C and T.A. Jerse. *Computer Music: Synthesis, Composition, and Performance*. New York: Schirmer Books, 1997.

[3] Webster, P. and D. Williams, *Experiencing Music Technology (3rd. ed. Update)*. New York: Wadsworth/Schirmer Books, 2008.

[4] https://elearning.psu.edu/courses/inart258/; a Friends of Penn State account (freely available) is necessary to view the course pages.

[5] Ballora, M., "On Teaching the History of Electro-Acoustic Music." *College Music Symposium,* v. 46, Fall 2006.

[6] Ballora, M., "Teaching Electroacoustic Music: Issues of History, Context, Pedagogy, and Student Expectation." 2006 Symposium of the Electroacoustic Music Studies Network (EMS06), Beijing, October 19-21, 2006. http://www.ems-network.org/spip.php?article227.

[7] http://www.music.psu.edu/Faculty%20Pages/Ballora/INART55/timeline.html

[8] http://www.music.psu.edu/Faculty Pages/Ballora/INART50/main.html

[9] http://nc2if.psu.edu/

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[8] There are roughly 40,000 students at Penn State's main campus, with admissions rising every year.