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# Behind the times? Digital Research Methods and the Music Classroom

By Timothy Duguid

2009 has been widely regarded as a watershed year for teaching and scholarship in literary studies, and one could argue for the humanities, broadly conceived.<sup>1</sup>

The annual meeting of the Modern Language Association was held in Philadelphia at the end of that year, and William Pannacker famously blogged for the Chronicle of Higher Education, “Amid all the doom and gloom of the 2009 MLA Convention...the digital humanities seem like the first ‘next big thing’ in a long time, because the implications of digital technology affect every field.”<sup>2</sup>

Three years after making the comment, Pannacker lamented that some had used

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<sup>1</sup> Matthew G. Kirschenbaum, “What is Digital Humanities and What’s It Doing in English Departments?,” *ADE Bulletin*, no. 150 (2010), 55-61.

<sup>2</sup> William Pannacker, “The MLA and the Digital Humanities,” *Chronicle of Higher Education* (blog), Chronicle of Higher Education, December 28, 2009, <http://chronicle.com/blogPost/The-MLAthe-Digital/19468>.

his comments to imply that the digital humanities was a “passing fad.”<sup>3</sup> Indeed, it would seem that DH, as it has come to be called, is no such thing. Many evidences could be presented in support of this claim, but the continued success of the DH annual conference, an ever-growing number of DH summer schools, countless grant programs, journals and publications across all humanities-related disciplines indicate that DH has staying power.<sup>4</sup> Although the digital humanities, or humanities computing, was not new in 2009,<sup>5</sup> what was new was the pervasiveness of the digital humanities at that 2009 conference. As Pannapacker noted later in his 2009 blog post, “...we are now realizing that resistance is futile. One convention attendee complained that this MLA seems more like a conference on technology than one on literature.”<sup>6</sup>

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<sup>3</sup> William Pannapacker, “Pannapacker at MLA: The Come-to-DH Moment,” *The Chronicle of Higher Education* (blog), Chronicle of Higher Education, January 1, 2012, [www.chronicle.com/blogs/brainstorm/pannapacker-at-the-mla-2-the-come-to-dh-moment/42811](http://www.chronicle.com/blogs/brainstorm/pannapacker-at-the-mla-2-the-come-to-dh-moment/42811).

<sup>4</sup> See also Brian Croxall, “The ‘Next Big Thing’ Ten Years Later: Digital Humanities at MLA 2019,” *Brian Croxall* (blog), April 16, 2019, <https://briancroxall.net/2019/04/16/the-next-big-thing-ten-years-later-digital-humanities-at-mla-2019>.

<sup>5</sup> It is important to note that digital humanities, or humanities computing, was not new in 2009. Workshops such as the “Teaching Computers and the Humanities” series sponsored by the Association for Computers and the Humanities, as well as the Computers and Teaching in the Humanities conference provide some early examples. Moreover, the 1980s and 90s saw the establishment of dedicated digital humanities centers such as the Center for Computing in the Humanities at the University of Toronto, the Centre for Computing in the Humanities (now the Department of Digital Humanities) at King’s College London, and the Humanities Advanced Technology and Information Institute at the University of Glasgow (now the Department of Information Studies).

<sup>6</sup> Pannapacker, “MLA and DH”.

Music-related studies in the academy have also experienced a digital awakening, even if it has not been accompanied by a similar “Aha!” moment to that of the 2009 MLA Convention. While music and technology have long been closely related,<sup>7</sup> recent developments in electronic and digital technologies have meant that musicians and scholars have had to become increasingly comfortable in the realms of physics, electrical engineering, and computer science. Reporting on the state of higher education institutions in the United Kingdom in 2007, Carola Boehm has traced the history of electronic music technology through three generations of researchers and innovators. The fourth generation was one in formation as Boehm was writing, and it included those who were then graduating from newly constructed degree programs in music technology. Before closing, Boehm envisioned a fifth generation that would move on to graduate-level education in the 20-teens. Despite this optimism, Boehm still concluded that music technology remained the discipline that “never was”.<sup>8</sup> A reassessment of music technology within the UK has since been published by Boehm *et al*, in which a sixth generation has been conceived. This generation is one for which

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<sup>7</sup> Western music history is replete with examples of music and technology working closely together: from the development of music printing, to the experiments with temperament, to the developments in instrument technologies.

<sup>8</sup> Carola Boehm, “The discipline that never was: Current developments in Music Technology in higher education in Britain,” *Journal of Music, Technology and Education* 1, no. 3 (2007): 7-21, doi: 10.1386/jmte.1.1.7\_1.

music technology has been cemented as an academic field, with the fourth and fifth generations having begun to have an impact on the industry.<sup>9</sup>

A recent examination of the pedagogical practices of 60 of the leading music schools in the United States, reveals a similar trend to that described in the UK by Boehm.<sup>10</sup> The 2019-20 undergraduate and graduate course catalogues of each of these institutions revealed that 59 offered technology-related courses to their students. This would suggest that technology has been successfully integrated into music classrooms (at least in the UK and in the USA). Given the emergence of ‘maker culture,’ it is unsurprising that many institutions are now offering courses on digital music recording, music synthesis technologies, sound production, music distribution and marketing, and multimedia integration and alignment (including audio in video, film and video games). One might even add music notation software to that mix, particularly given the divergent idiosyncrasies of LilyPond, Finale, Sibelius, MuseScore, Dorico, etc.<sup>11</sup>

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<sup>9</sup> Carola Boehm, Russ Hepworth-Sawyer, Nick Hughes, Dawid Ziemba, "The discipline that 'became': Developments in Music Technology in British higher education between 2007 and 2018," *Journal of Music, Technology & Education* 11, no. 3 (2018): 251-267, doi: 10.1386/jmte.11.3.251\_1.

<sup>10</sup> Timothy Duguid, "United States Music Schools Survey 2019," *Enlighten Publications*, University of Glasgow (2020), <http://eprints.gla.ac.uk/226129/>.

<sup>11</sup> Although the issues with these software packages are well documented, Martin Keary's reviews provide some representative examples of this criticism. Martin Keary, "Tantacrul", *YouTube* channel, <https://www.youtube.com/user/martinthekearykid>.

Admittedly, this list of subjects is almost exclusively focused on aspects of music creation and production rather than music performance, curation and analysis (broadly conceived). The latter set provided the fuel for the digital awakening at the 2009 MLA, and they are the methods most often employed by those who claim the title of digital musicologists. In a similar way, digital musicology is a burgeoning subfield that has spurred several academic journals and high-profile international conferences such as the Music Information Retrieval and Digital Libraries for Musicology conferences, as well as focused efforts at the Performance Studies Network and Medieval and Renaissance Conference. These have been accompanied by the development of numerous digital tools and resources.<sup>12</sup> Rather than attempting to provide a full survey of the field here, the past few years have seen several excellent surveys, including Michelle Urberg's historical exploration of digital humanities-related approaches in the field of musicology from Temperley's monumental Hymn Tune Index in the 1980s to the ongoing development of Music Scholarship Online (MuSO) in 2018,<sup>13</sup> and Heather Platt's review of the latest trends related to nineteenth-century music.<sup>14</sup>

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<sup>12</sup> Eleanor Selfridge-Field's Digital Resources of Musicology remains perhaps the most comprehensive listing of these resources. Eleanor Selfridge-Field, "Digital Resources for Musicology (DRM)", Center for Computer Assisted Research in the Humanities, Stanford University (2017), <https://drm.ccarh.org/>.

<sup>13</sup> Michelle Urberg, "Pasts and Futures of Digital Humanities in Musicology: Moving Towards a 'Bigger Tent'", *Music Reference Services Quarterly* 20: no. 3-4 (2017): 134-150, doi: 10.1080/10588167.2017.1404301.

<sup>14</sup> Heather Platt, "The Digital Humanities and Nineteenth-Century Music: An Introductory Overview," *Nineteenth-Century Music Review* (2020), 1-16, doi:10.1017/S1479409820000014.

## The challenge

Taken altogether, one might be tempted to conclude that the digital transformation in the music academy (including the full lifecycle of musical scholarship – creation, performance, curation, and analysis) is well in hand, as Platt argued, “The digital humanities have influenced music scholars across the globe; and there is a wide range of organizations supporting this field...”<sup>15</sup> While this may be true, Platt’s unqualified positivistic stance belies the fact that digital musicology still faces a broad range of challenges, particularly with digital methods related to performance, curation and analysis. Alexander Street Press’s recent shuttering of the Open Music Library, its open-access linked-data music database and research tool, provides one glaring example. A consideration of the annual meetings of the American Musicological Society, Society for Music Theory, and the Royal Music Association (Figure 1) provides an even more illuminating perspective. Inspecting the published abstracts for the AMS and SMT dating back to 2010 and the RMA back to 2016 (earlier ones are not available on their website), a bleak pattern emerges. The AMS has twice featured 8 papers, posters, or roundtables that include digital humanities methods in their abstracts: in 2012 and 2019. However, these two years were significant outliers, as the remainder have featured between

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<sup>15</sup> Platt, “Digital Humanities”.

0 and 4 presentations. Even if one accepts that some presentations may have been excluded from these counts because their abstracts do not mention any digital methods, the overall percentage remains paltry considering the conference's size. For instance, 2019 featured more than 380 different presentations, which means that only 2% included digital methods.

[Figure 1]

In comparison with the Society for Music Theory and the Royal Music Association, the AMS could be considered more progressive in its digital offerings. If one ignores the joint conference held by the SMT and AMS every two years, the SMT has featured only 4 presentations mentioning digital methods. The Royal Music Association is not any better, as 2017 and 2019 were the high-water marks, featuring only 2 presentations that mentioned digital methods. These numbers from the AMS, SMT and RMA indicate an absence of digital methods from the research workflows of many historical musicologists, or at least those individuals whose research is considered worthy of their society's attention.

A closer investigation of the courses offered at 60 of the leading music institutions in the U.S., those mentioned earlier, reveals a similar trend to that at

national conferences.<sup>16</sup> If one limits the results to those courses that employ digital musicology-related research methods (i.e. optical music recognition, notation encoding; GIS; score-media alignment; metadata generation and curation; social network analysis; and computer-aided distant reading of corpora, just to name a few), one is left with only 27 courses spread across undergraduate and graduate programs that advertise digital research methods. And, that generously includes the courses on notation that purport to include the latest developments in digital music notation but that may or may not include music encoding.<sup>17</sup> If those notation courses are removed from the list, the number drops to 11. Despite the progress of digital research methods in literature, history, art, and other disciplines, astonishingly only 11 course descriptions in undergraduate and graduate programs in the 60 most reputed music institutions of higher education in the United States advertise using these methods.

Conference abstracts and course descriptions are admittedly incomplete representations of the state of any field. Indeed, course catalogues are idiosyncratic, both in each institution's online manifestation and in terms of the amount of detail that is presented. However, these analyses do highlight the

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<sup>16</sup> Duguid, "Music Schools."

<sup>17</sup> As a side note, this list of methods excluded courses that utilized image-based collections and repositories. While beneficial to music teaching and research, there is little computational difference between their utilization and that of PDFs or even hard copies of notated music.

current priorities of today's music academy - and particularly in the core areas of music history, literature, and theory - in the ways it represents itself both to its members and to its students. Emerging areas such as music recording, sound production, and electroacoustics - those fields commonly included under the umbrella of music technology - have largely adopted digital methods in their research and pedagogical workflows and they are eager to advertise their technological foundations. Even applied musical instruction has begun to incorporate and promote more digital resources, as more apps are being built to provide access to sheet music, to record practice or performance, and for immediate analysis for those performances. Despite the advances within digital musicology research, classroom instruction in musicology and music theory remain largely unchanged. This is not to suggest that musicology and music theory teachers are unaware of the developments in the digital humanities, nor are they ignorant of the goings-on in the digital humanities. A survey conducted by Inskip and Wiering in 2015 would indicate that a lack of freely available digital data is one of the largest barriers to widespread implementation of digital research methods. However, it is also true that a large number are generally uneasy about computers - after all, they argue, learning how to use Finale and Sibelius was traumatic enough!<sup>18</sup> Regardless of the reasons, students continue to pass through

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<sup>18</sup> Charles Inskip and Frans Wiering, "In their own words: using text analysis to identify musicologists' attitudes towards technology," in *Proceedings of the 16th International Society for Music Information Retrieval Conference* (Malaga, Spain: International Society for Music

theory, literature and history curricula thinking that the cutting edge in these fields remains closely tied to analogue outputs or digital recordings. Relatively speaking, then, both in terms of other humanities-related and even music-related fields, there is still much potential that is yet unrealized and therefore more work to be done in the areas of music history, theory and literature.<sup>19</sup>

## Role of libraries

So, what are the music librarians and music scholars to do? The digital humanities have offered two successful models for promoting digital research methodologies across universities: the digital research center and the library hub. Each approach has its own advantages and disadvantages, which extend beyond the scope of the present discussion.<sup>20</sup> However, it is increasingly apparent that the library forms a key component, regardless of the model that is employed. Libraries are increasingly becoming the laboratories of the modern University.<sup>21</sup> Where

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Information Retrieval, 2015), 1-7, [https://www.researchgate.net/publication/291096095\\_In\\_their\\_own\\_words\\_using\\_text\\_analysis\\_to\\_identify\\_musicologists'\\_attitudes\\_towards\\_technology#fullTextFileContent](https://www.researchgate.net/publication/291096095_In_their_own_words_using_text_analysis_to_identify_musicologists'_attitudes_towards_technology#fullTextFileContent).

<sup>19</sup> This echoes Urberg's assessment. Urberg, "Pasts and Futures".

<sup>20</sup> For more, see Jennifer Schaffner and Ricky Erway, "Does Every Research Library Need a Digital Humanities Center?" *OCLC Research* (2014), <https://files.eric.ed.gov/fulltext/ED564811.pdf>; and Micah Vandegrift and Stewart Varner, "Evolving in Common: Creating Mutually Supportive Relationships Between Libraries and the Digital Humanities," *Journal of Library Administration* 53, no. 1 (2013): 67-78; doi: 10.1080/01930826.2013.756699.

<sup>21</sup> There are numerous publications making this claim. For instance, see Andrea Ogier, Anne Brown, Jonathan Petters, Amir Hilal and Nathaniel Porter, "Enhancing Collaboration Across the Research Ecosystem: Using Libraries as Hubs for Discipline-Specific Data Experts," *Proceedings*

students once poured over books and journal articles, they now gather with their favorite caffeinated beverage to study and apply that which has been presented in their lectures. For libraries are increasingly ceding shelf space to collaborative meeting areas and Maker Spaces.<sup>22</sup> Libraries are becoming spaces where experimentation occurs, where students and faculty gather to gain knowledge, to apply it, and to develop expertise. At a more fundamental level, libraries often act as the cultural heritage repository of the entire university. In an increasingly digital academy, libraries are therefore asked to leverage digital technologies in fulfilling this basic mandate. Libraries are therefore expected to be aware of standards in data curation and management and to implement those standards in their own praxis. It is expected that researchers throughout the university should be able to turn to their libraries for help in accessing, using, and analyzing existing datasets and then reporting findings in ways that adhere to standards in access and discoverability.

From a musical perspective, libraries not only provide access to collections, but they should be able to promote emerging methods, indeed digital research

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*of the Practice and Experience on Advanced Research Computing* (July 2018): 1-6, doi: 10.1145/3219104.3219126.

<sup>22</sup> One U.S.-based collegiate ranking website implies that a quality Maker Space should be one of the determining factors for choosing a University. “50 Best Maker Spaces: These Cutting Edge College Collaborative Spaces Truly ROCK!”, *Great Value Colleges* website (accessed September 2, 2020), <https://www.greatvaluecolleges.net/best-maker-spaces/>.

methods, for working with those collections. As experts in curatorial practice, librarians can also encourage colleagues in music departments to develop responsible digital curatorial practices that allow for effective preservation and scholarly communication via institutional repositories or other digital outlets. Of course, some of this work is already underway, and these efforts should all continue, but I would argue that an increased emphasis on exposing undergraduate and graduate-level music students (and by extension those teaching the students) to digital humanities methodologies is a critical step in transforming the discipline. Following Boehm's outline, one could argue that digital musicology may only be in its second or third generation, so now is the time to start promoting its use in the classroom.

There are several tactics that libraries could employ in promoting digital musicology in the classroom, but an effective strategy must consider the barriers that currently exist. Claire Battershill and Shawna Ross in their recent monograph *Using Digital Humanities in the Classroom*, discuss the more common barriers, categorizing them according to the source: that is as coming from the instructor, students, and colleagues.<sup>23</sup> These issues are magnified in that music pedagogues cannot rely on a set of tried and tested methods for incorporating digital methods

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<sup>23</sup> Claire Battershill and Shawna Ross, *Using Digital Humanities in the Classroom* (London: Bloomsbury, 2017), pp. 13-24.

into their classrooms, and particularly music history and music theory classrooms. Librarians should therefore recognize that their efforts in promoting digital methods include first, asking teachers to innovate new methods of classroom instruction, and second, challenging students to think outside of the boxes of assessments that are often very specific to the course and activity. Progress may therefore be slow in convincing colleagues and students of the benefits of these methods. As argued by Andrew Goldstone, “Beginning data analysts cannot know the range of possible methods they might use. They know what they have studied, and especially in the early stages, they have to spend time simply learning how to apply the techniques they have been shown.”<sup>24</sup> The remaining discussion highlights some principles to consider when building an effective strategy.

## Strategizing the Digital Musicology Classroom

For those subjects traditionally affiliated with the digital humanities such as literature and history, there are those who have been teaching courses that incorporate digital research methods for nearly a decade, so their experiences can be particularly instructive. In the early 20-teens, approaches to digital humanities pedagogy were widely varied. On the one hand, researchers were simply teaching

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<sup>24</sup> Andrew Goldstone, "Teaching Quantitative Methods: What Makes it Hard (in Literary Studies)," *Debates in the Digital Humanities* (Minneapolis: University of Minnesota, 2019), <https://dhdebates.gc.cuny.edu/read/untitled-f2acf72c-a469-49d8-be35-67f9ac1e3a60/section/620caf9f-08a8-485e-a496-51400296ebcd#ch19>.

students based on their own research and methods, which varied from project to project and person to person. On the other, it confused many students who were trying to figure out what this “digital humanities” thing was (incidentally, something that practitioners themselves still have difficulty defining). However, the field has begun to coalesce, leading Deborah Garwood and Alex Poole to conclude that “DH pedagogy inspires students and faculty members to critically, openly, collaboratively, collectively and symbiotically to explore existing or to carve out new research and scholarly areas across disciplines.”<sup>25</sup> Teaching digital research methodologies in music and music-related subjects is no different: it should inspire students and faculty to critically, openly, collaboratively and collectively explore existing scholarship and establish new areas of inquiry that are not necessarily limited by disciplinary boundaries.

At the same time, pedagogues in music technology have similarly developed standards for instruction that should inform music history, literature, and theory curricula. Writing in 2001, a pre-web-2.0 world, David Beckstead explored the ways in which technology might impact music pedagogy, agreeing with the conclusions of Sara Kiesler some nine years earlier that technology should either

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<sup>25</sup> Deborah A. Garwood, Alex H. Poole, "Pedagogy and public-funded research: an exploratory study of skills in digital humanities projects," *Journal of Documentation* 75, no. 3 (2019): 552, <https://doi.org/10.1108/JD-06-2018-0094>.

be “amplicative” or transformative.<sup>26</sup> William Bauer later added, “There is no single technological solution that is appropriate for every teacher, school, classroom, or student. Rather, the effective integration of technology requires teachers to thoughtfully consider how content, pedagogy, and technology work together in a specific teaching and learning context.”<sup>27</sup> The challenge for the teacher is therefore to be able to select which technologies will be the best fit for the purposes of their specific subjects. As a response, Elena Macrides and Charoula Angeli have promoted the Technological Pedagogical and Content Knowledge (TPACK) framework within music classrooms,<sup>28</sup> which encourages the balancing of the three overlapping types of knowledge from which it derives its name (Figure 2). TPACK is based on Lee Shulman’s theory of Pedagogical content knowledge (PCK), and it maintains that there is an intersection of technological, pedagogical, and content knowledge in any given context, and the area in which all three intersect should be the teacher’s focus.<sup>29</sup>

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<sup>26</sup> David Beckstead, “Will Technology Transform Music Education?” *Music Educators Journal* 87, issue 6 (May 2001): 44-49. Sara Kiesler, “Talking, Teaching and Learning in Network Groups,” in *Collaborative Learning through Computer Conferencing*, ed. Anthony Kaye (Berlin: Springer, 1992), pp. 147-65.

<sup>27</sup> William I. Bauer, *Music Learning Today: Digital Pedagogy for Creating, Performing, and Responding to Music* (Oxford: Oxford University Press, 2014), p. 15.

<sup>28</sup> Elena Macrides and Charoula Angeli, “Domain-Specific Aspects of Technological Pedagogical Content Knowledge: Music Education and the Importance of Affect,” *TechTrends* 62 (2018): 166-175, doi: 10.1007/s11528-017-0244-7

<sup>29</sup> For more on TPACK, see Matt Koehler, “TPACK Explained,” *TPACK.org* (2012): <http://matt-koehler.com/tpack2/tpack-explained/>.

[Figure 2]

Just as Bauer argued that a single technological solution would not suit all classrooms, no single strategy or series of promotional efforts will bring digital methods to music history, literature and theory classrooms. However, there are some important principles to consider when interacting with teachers and students that will greatly enhance their experience with digital methods. With both existing digital humanities and music pedagogy backgrounds in focus, three principles should be considered: audience-focused content and delivery, progressive incorporation of digital methods, and technology-adjacent skills development.

## Audience-focused content and delivery

Modern society is fixated on audiences, customers, and even students. Student-centered teaching strategies have become quite popular in the past couple of decades. Evaluating the goals of his students, Ryan Cordell boldly asserts, “undergraduate students do not care about digital humanities,” and he continues “most graduate students...do not come to graduate school primarily invested in becoming ‘digital humanists’”.<sup>30</sup> In other words, students often need to be shown how their learning and research can be enhanced by digital humanities methods.

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<sup>30</sup> Ryan Cordell, "How not to Teach Digital Humanities," *Debates in the Digital Humanities*, ed. Matthew K. Gold (Minneapolis: University of Minnesota, 2016), <https://dhdebates.gc.cuny.edu/read/untitled/section/31326090-9c70-4c0a-b2b7-74361582977e#ch36>

Cordell's comments could also be applied to music students in higher education: most music students do not come to their undergraduate or graduate programs invested in becoming digital musicologists or digital music theorists. One could take this one step further, though. There was a pervasive theory in pedagogical writing around the turn of the century that students were "digital natives" and were therefore more comfortable with and competent in all activities relating to computers. However, as Brandon Locke comments, "Students are often much less adept at creating content that is not tightly mediated by some kind of commercial service with restrictions on form (e.g. Snapchat, Twitter, Facebook)." <sup>31</sup> Students are therefore just as reticent as other generations when it comes to angle brackets and curly braces. Indeed, despite the "digital natives" moniker that sadly still surfaces in the pedagogical literature, it is important to remember that many music students will not have the inbuilt, innate, or otherwise preexisting familiarity with or comfort with code-based analysis tools. Nor do most of them innately want to spend a significant time learning how to code and encode.

When considering and developing course content that utilizes digital methods, one should therefore consider the students' skill levels at entry and the desired

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<sup>31</sup> Brandon T. Locke, "Digital Humanities Pedagogy as Essential Liberal Education: A Framework for Curriculum Development," *Digital Humanities Quarterly* 11, no. 3 (2017): <http://www.digitalhumanities.org/dhq/vol/11/3/000303/000303.html>.

results once they complete the course. As an illustration, I point to a course I teach at Glasgow called Music Curation and Analytics, which is offered to upper-level undergraduates in Information Studies. Many of these students are not music students and have not had any formal training in music. The first year I taught the course, I had them transcribe a piece of music in MuseScore and then export it to musicXML and on to MEI (Music Encoding Initiative) before they then edited the MEI file. The idea was that they would gain experience in understanding each format. Since the students already had a level of XML training, I figured that they would be able to handle the MEI modification. For students who had a background in music, this task was not too onerous, but others really struggled with the transcription in MuseScore - despite me providing a basic introduction to reading Western music notation - because they remained too unfamiliar with music terminology and therefore spent much of the semester trying to transcribe their piece, let alone considering what changes could be made to the MEI. In the second year, I focused less on the specifics of music notation and more on the comparisons between the MusicXML file and the MEI file, describing the differences and what those meant both semantically and in terms of the capabilities of both formats. Students did much better with this approach, given their existing background in XML. Indeed, this latter approach was much more attuned to the course objectives, which were to introduce students to the ways in

which music-related information is created, stored, analyzed and otherwise reused.

## Progressive incorporation of digital methods

Despite this anecdote, some outside this community (and perhaps some within it) might argue that digital methods in music are too new, and their accompanying toolsets are too underdeveloped to be presented in the classroom. Those promoting this view might worry that students (and perhaps even the instructors) could be overwhelmed and frustrated by complicated software installations and tools that frequently “break” or do not perform as expected. On the one hand, this risk can be reduced by limiting student expectations of the technology. For instance, MEI rolled-out version 4.0 while I was in the middle of teaching music encoding to a group of Master’s students. This new version involved significant changes to the way metadata was captured, and this impacted some of the validation functionality afforded by plugins in our code editor. However, at the beginning of the course, several weeks in advance of the release, I had mentioned that MEI is a community-based standard for encoding music notation and that those standards can change to adapt to meet the needs of the community. The students were therefore much more flexible in their expectations of the technology. Rather than causing significant upheaval in the middle of the class, the update in MEI versions offered us the opportunity to explore the new

guidelines and to learn from them together. We were able to discuss the changes and to consider the semantic impacts of those changes. This is a relatively tame example, but there are others in which something may wholly fail. Indeed, Katherine Harris goes so far as to insist that students *will* break digital tools.<sup>32</sup> As Lisa Spiro notes, however, "...the digital humanities community recognizes the value of failure in the pursuit of innovation...since it indicates that the experiment was likely high risk and means that we collectively learn from failure rather than reproducing it (assuming the failure is documented)."<sup>33</sup> Indeed, students should not be completely shielded from unsuccessful results. Rather, they should be trained in ways to document them and to learn from them.

[Figure 3]

Beyond turning these challenges and even failures into positive learning experiences, there are other ways to limit students' potential exposure to frustrating results, at least until they have reached a point at which they can either troubleshoot them or can properly contextualize their experience. A progressive strategy for introducing digital methods, as suggested in Figure 3, would be a

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<sup>32</sup> Katherine D. Harris, "Play, Collaborate, Break, Build, Share: 'Screwing Around' in Digital Pedagogy The Debate to Define Digital Humanities...Again," *Polymath: An Interdisciplinary Arts and Sciences Journal* 3, no. 3 (Summer 2013): 21.

<sup>33</sup> Lisa Spiro, "'This is Why we Fight': Defining the Values of the Digital Humanities," in *Debates in the Digital Humanities*, ed. Matthew K. Gold (Minneapolis: University of Minnesota, 2012) <https://dhdebates.gc.cuny.edu/read/40de72d8-f153-43fa-836b-a41d241e949c/section/9e014167-c688-43ab-8b12-0f6746095335#ch03>

significant step forward. Of course, tiered approaches to curricula are nothing new to music pedagogues who teach a broad range of courses from music appreciation to advanced Schenkerian analysis. However, the same pedagogues may not have considered that a similar approach may be required for digital methods. Given the general reticence that many have towards computers, digital pedagogues need to start with some simple digital discovery before throwing students into the world of angle brackets and curly braces. That is, show them the utility and capabilities that digital methods afford. This is the step that many digital humanities instructors missed in the early 20-teens, as they rushed to create survey courses that too often forgot that students first needed to be convinced that digital methods were worth their time and attention. As Cordell notes, students and colleagues are more receptive to digital methods when they are integrated into a course that they already deem to be relevant to their studies.<sup>34</sup> Indeed, this is what Adeline Koh also describes, as she encourages instructors to employ the tools with which students are most familiar (i.e. Google Maps, Wikipedia, etc.) before delving into more complicated elements.<sup>35</sup> Music teaching should therefore start with simple tools that are integrated into survey curricula to provide data-intensive illustrations of the overarching discipline-specific concepts that are

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<sup>34</sup> Cordell, "Teach Digital Humanities."

<sup>35</sup> Adeline Koh, "Introducing Digital Humanities Work to Undergraduates: An Overview," *Hybrid Pedagogy* (13 August 2014), <https://hybridpedagogy.org/introducing-digital-humanities-work-undergraduates-overview/>.

being taught. Following the principles of TPACK and audience considerations, it is critical that the expertise and training for the digital method should at this initial level be minimal so that it does not overshadow subject-specific training.

Jonathan Howell provides a helpful illustration of the balance required at this level. He describes how he created a linguistics course that relied heavily on R, but that his students struggled to keep up with both the programming requirements of the course and the linguistics content. Before offering the course a second time, he built a web application that allowed his students to take advantage of analytical tools offered by R without requiring them to know how to code in R. The result was a much better student experience that recognized the benefits of digital approaches within the context of linguistic research.<sup>36</sup>

Resources such as the Verovio Online Editor and jSymbolic could be incorporated in this same way because they do not require significant coding expertise at the outset. However, music pedagogy would benefit from more of these types of low-level digital tools that allow students to start familiarizing themselves with digital methods.

There are, of course, limitations to digital tools, as Locke argues, “Tool-based literacy limits sustainability, cross-platform work, and understanding of the

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<sup>36</sup> Jonathan Howell, "When Technology is too Hot, too Cold or Just Right," *Emerging Learning Design Journal* 5 (2017): 9-18, <https://digitalcommons.montclair.edu/cgi/viewcontent.cgi?article=1020&context=eldj>

impact of media upon the message.”<sup>37</sup> It is therefore important to build on the initial introductions that occur in the first tier with both surveys of digital research methods and more focused digital training to provide much-needed critical skills to evaluate those digital methods. Although they are not a degree-based curricula, the offerings of initiatives such as the Digital Humanities Summer Institute (DHSI) and the Digital Humanities at Oxford Summer School are a helpful exemplars. These provide one-week intensive courses on various aspects related to digital humanities research and pedagogical practices, operating on the assumption that their students have already encountered digital methods within their coursework, research, or teaching. This digital first contact has their students itching to learn more, but they may not have any level of technical expertise. Summer schools such as these therefore offer a number of courses that provide entry-level surveys of digital methods and training in courses such as TEI, DH technologies, introductory computation, digitization, and even digital musicology.<sup>38</sup> Equivalent courses and competencies within degree-based music instruction could include introductions to music encoding, computational analysis, and other digital research methods. The key is that these courses should

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<sup>37</sup> Locke, “Liberal Education.”

<sup>38</sup> For a list of courses at DHSI, see “Course Offerings,” *Digital Humanities Summer Institute (DHSI)*, <https://dhsi.org/course-offerings/> (accessed 6 November 2020); DHOxSS maintains an archive at “DHOxSS Archive”, *Digital Humanities at Oxford Summer School (DHOxSS)*, <https://digital.humanities.ox.ac.uk/dhoxss-archive> (accessed 6 November 2020).

effectively build from the ground up, that is, they should start with the assumption that students have little or no expertise in that particular area.

The third and final step in this tiered approach involves offering much more advanced instruction in digital research methods that require a certain level of expertise at the outset. These courses may explore the areas of computer learning, analytical methods in python or R, or even combinations of digital methods, and often these courses are much more focused in terms of their musical remit. For instance, one could envision a course on computational stylistic analyses of Fanny Hensel's oeuvre.<sup>39</sup>

## Skills development

Aside from the progressive development of technical expertise, there are several related non-technical skills that should also be introduced. The following discusses two of the more significant of these accompanying skills that are becoming increasingly valuable to digital humanities and digital musicology enquiry: digital literacy and collaboration.

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<sup>39</sup> A similar hierarchical structuring of instruction is proposed by Cordell. Cordell, "Teach Digital Humanities."

## Digital literacy

Despite increased use of digital methods within the classroom, Locke comments, “there should be reason for concern that students are often taking part in digital information and media transmission, but are not currently trained in the literacies and affordances of the technology they use.”<sup>40</sup> Indeed, it is almost cliché that every course today claims to instill in students critical thinking skills, but few consider how students in the digital age can be trained in critical thinking so that it approaches what Locke and others would label digital literacy. Although students are accustomed to taking surveys and to providing reviews of their meals and shopping experiences, it can be difficult to encourage them to think outside their own experience and particularly about the strengths and weaknesses of the digital methods they have used and the resulting limitations of the data they produce. I would argue that there are four components to digital critical evaluation.

First and foremost, students need to have the requisite subject knowledge to be able to contextualize information. Then they should be afforded the opportunity to apply that knowledge while playing with specific digital tools. This approach to digital pedagogy is well established across the sciences and humanities, as is

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<sup>40</sup> Locke, “Liberal Education.”

chronicled by Jentery Sayers.<sup>41</sup> Despite the benefits of allowing students the space to play with digital tools and methods, Nuria Garcia, *et al* caution that the digital sandboxes established for classrooms need to have boundaries, arguing:

The goal in the college classroom should not be to allow for open-ended digital play and exploration of the kind that professional humanities scholars are motivated to undertake, because as one learner noted, 'the amount of information can truly be overwhelming, and a large part of the success of this exercise seems to lie in not only how to use the [digital] tools to the best advantage, but in...avoiding dead-ends.'<sup>42</sup>

Even if students are afforded the space to tinker with digital tools, they often lack the ability to understand the raw data they are gathering, particularly if it is quantitative data. As Jonathan Howell argues, "...quantitative literacy ought not to be regarded by the instructor in a non-STEM field as an add-on to existing course content, but ideally as an integral part of teaching students how to be a

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<sup>41</sup> Jentery Sayers, "Tinker-Centric Pedagogy in Literature and Language Classrooms," in *Collaborative Approaches to the Digital in English Studies*, ed. Laura McGrath (Logan, UT: Computers and Composition Digital Press, 2011), [https://ccdigitalpress.org/book/cad/Ch10\\_Sayers.pdf](https://ccdigitalpress.org/book/cad/Ch10_Sayers.pdf).

<sup>42</sup> Nuria Alonso Garcia, Alison Caplan, and Brad Mering, "A Pedagogy for Computer-Assisted Literary Analysis: Introducing GALGO (Golden Age Literature Glossary Online), *Digital Humanities Quarterly* 11, no. 3 (2017): <http://www.digitalhumanities.org/dhq/vol/11/3/000323/000323.html>.

historian/anthropologist/classicist/etc.”<sup>43</sup> For example, the COVID-19 outbreak has provided an unparalleled deluge of quantitative data for public consumption. There have been daily updates of test rates, positive test results, negative test results, hospital admission statistics, ICU admission statistics, daily deaths with COVID-19 listed as a potential cause, deaths of people who had previously tested positive for COVID-19, care home deaths, and “R-numbers.” Despite all this raw data, it has been painfully obvious that many (including the media and politicians) are ill-equipped to parse the numbers and to understand what the numbers mean and what they do not mean. Similarly, as quantitative analyses become increasingly present in musical analysis, it is important for the field to consider how it can teach students how to value these analytical techniques and the data they generate, evaluating the assumptions inherent in the methods and tools and thereby critically evaluating the conclusions that result.

Moreover, focusing solely on digital and quantitative methods provides students with a limited scope and therefore hampers their ability to critically evaluate those methods. As suggested by Paul Fyfe the combination of analogue and digital methodologies gives students the requisite space for critical observation. In a class on *Pride and Prejudice*, Fyfe comments,

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<sup>43</sup> Jonathan Howell, "When Technology is too Hot, too Cold or Just Right," *Emerging Learning Design Journal* 5 (2017): 16, <https://digitalcommons.montclair.edu/cgi/viewcontent.cgi?article=1020&context=eldj>.

Unplugging the search engine can help students perceive the limitations as well as the possibilities of what makes these engines run: pattern matching, which by itself is a far cry from reading at any distance. It sharpens students' attention to forms of analysis that explore the analog and digital domains along a continuum. It helps students to interrogate the various kinds of readings they can do therein. And it reveals all of those kinds of readings as actively constituting critical interpretations.<sup>44</sup>

Critical evaluation of digital tools, resources, and methods require students first to have discipline-specific knowledge of music. Using music encoding as an example, students should be trained in how to encode that music before they are given space to play around with various approaches to encoding music. Whether or not quantitative methods have been used, the students need training to illuminate the strengths and weaknesses of the encoding techniques they have employed. Finally, students need to be able to compare these digital methods with analogue versions of the same.

## Collaboration

In addition to digital literacy, digital pedagogies in music should include some training and experience in collaboration. This may be an area of discomfort for

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<sup>44</sup> Paul Fyfe, "Digital Pedagogy Unplugged," *Digital Humanities Quarterly* 5, no. 3 (2011): <https://www.digitalhumanities.org/dhq/vol/5/3/000106/000106.html>.

many working in the areas of music history, literature, and theory, who, as noted by Kris Shaffer, prefer working in isolation.<sup>45</sup> However, one of the hallmarks of the digital humanities has been the promotion of collaborative research. Digital humanists freely recognize that no one person possesses the requisite skills and knowledge to produce a high-quality digital resource. Students should therefore be confronted with this reality: they may not be able to master all things musical while also trying to master all things digital. They should therefore be encouraged to specialize and then to collaborate with those with complementary specialties. Even so, as Rebecca Frost Davis asked, "...but how do you *teach* collaboration?". This question has been problematic in DH pedagogy, particularly in terms of assigning credit in assessments. Recognizing the potential inequity of assigning all group participants the same grade regardless of their contribution level, some have innovated systems of assessing each person according to their contribution to the group's final output.

One method developed for my Music Curation and Analytics class does seem to encourage both group interactions as well as individual autonomy and responsibility. While writing the course proposal, it was clear that most students would not know how to read Western music notation and that there was not time

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<sup>45</sup> Kris P. Shaffer, "A Proposal for Open Peer Review," *Music Theory Online* 20, no. 1 (February 2014), <https://mtosmt.org/issues/mto.14.20.1/mto.14.20.1.shaffer.php>.

to provide significant training in this while also covering aspects of encoding and curating notation data. Two other facts were also clear in planning this course. First, students rarely invest the amount of time outside of class that the University recommends. Second, students are often frustrated by graded group projects because of the inequalities in effort that often surface. The solution was to schedule a session at the beginning of each week during which students have a structured time to prepare for the week's lecture. During that period, they would be given a brief introduction to the week's topic, and then they would be asked to "play" together in groups, trying to accomplish some set tasks that are unassessed. The following day, the lecture would begin with a period discussing the group work before launching into the theoretical underpinnings of the activities they just completed. Afterwards, there would be a scheduled lab period in which students would need to work individually on an assessed task that builds on that week's group activity and lecture. During the first week's group session, I told the students that they could form their own groups, but I made sure that each group had at least one person who could read music. For the tasks relating to music notation (i.e. using MuseScore to transcribe a piece of music or encoding a piece to MEI), the person who could read music was asked to assist those who could not. This approach to group work was largely successful, and by the end of the semester the students were working well together not only on the group activities but also on their individual assignments. In fact, several of the students remarked

that the group session helped them to better understand both lecture content and to be better prepared for the assessments. Not every course or situation may lend itself to this level of group activity, but even smaller scale introductions can have a positive impact on collaborative skills.

## Conclusion

Imagine a situation in which a music theory instructor is teaching about chord progressions and asserts that an Authentic Cadence is the most common way to end a piece of tonal Western music. Immediately a student shouts, “Prove it!” I daresay the vast majority of instructors today would not be able to prove it, even though they might be able to point to some important examples. While unassailable proof might be outside our grasp (particularly considering how little music throughout history has been preserved), it is well within the realm of possibility that said instructor could run a quick script on a large corpus of music and show that student that an Authentic Cadence is indeed most prevalent. At the same time, however, said instructor could simultaneously discover that a VI-I cadence is also common in a certain group of pieces, which then could provide an avenue of investigation for both the instructor and the class. Situations like this arise on a regular basis within digital humanities classrooms around the world,

even if on a smaller scale. With training and a strategic approach to digital methods implementation, the same could be true for music classrooms.

Libraries should play that crucial role in the pedagogical implementation of digital methods. As research hubs, libraries should be able to point students and teachers to the resources they need, including digital datasets. More than providing an encyclopedic knowledge of musical datasets, libraries should be able to support the use of those datasets by either offering training and expertise in digital methods themselves, or by pointing students and teachers to others who can provide them and thereby encourage the development of new collaborations. It is therefore essential that libraries continue to invest in their employees by providing them with opportunities to expand their skillsets in digital research methods. In some cases, the networking and awareness of emerging practices that can occur at conferences such as the MLA annual meeting and more specialist gatherings such as the Digital Libraries for Musicology conference or the Music Encoding Conference can be sufficient for librarians to be able to direct their patrons to practitioners and experts. In addition, initiatives such as the Digital Humanities Summer Institute and the Digital Humanities at Oxford Summer School (as well as other located at institutions such as University of Cambridge, Utrecht University, Stanford University, and McGill University) provide ideal opportunities for librarians to learn the technologies themselves so that they can

offer workshops and training at their home institutions. By promoting best practices in both research and teaching as a collective, we can, like Boehm, look ahead to our own fourth, fifth, and sixth generations of digital musicologists and the exciting innovations that will accompany them.

## Abstract

Digital methods have begun to make their way into the research practices of music scholars, and most of this insurgence can be attributed to the rise of the discipline of music technology. Though digital humanities-related research methods is becoming increasingly prevalent among the research and teaching methodologies of music scholars, evidence gathered from course descriptions and presentations at national meetings of music scholars would indicate that these digital methods continue to lag other music-based technologies. Drawing from the advancement of music technology and the experiences of digital humanities teaching and scholarship, this paper presents a path for libraries to promote greater integration of digital methods into the pedagogical practices of music historians and music theorists.