# 7

# Logistics: “Bit by Bit, Putting It Together”

## Finding Common Ground

The Sondheim and Lapine song *Putting It Together* [[9](#_ENREF_9)] refers to the many challenges facing an artist trying to produce an artistic product and overcome the myriad obstacles to getting funding and recognition. Most people involved in the arts as creators and performers can certainly identify with the many logistical issues highlighted by the song. As the lyric so aptly states, “The art of making art, is putting it together” [[9](#_ENREF_9)]. Creating or producing the “product” can result in a physical work of art, a performance piece, or, for the purposes of this book, a new software application. Although some may claim divine intervention or inspiration as the muse, it is generally the result of numerous fits and starts, multiple stages of development, attention to minute details, and more hours than one would care to think about. And that is just the beginning. Getting the work “out there” requires just as much attention. The goal of this chapter is to bring you into the process of “putting together” an interdisciplinary project or course, putting together a project team, and getting it and them off the ground.

Logistics is one of the many challenges in this kind of collaborative endeavor. It becomes particularly problematic at the college level for both professors and students. Professors’ schedules are difficult to synchronize, but students’ schedules are, too, especially when students have different majors. Gena’s previous experiences with attempting interdisciplinary projects with colleagues from different disciplines, along with her experiences developing partnerships with local music teachers, informs much of how we structure our projects and negotiate our collaboration, both with each other and within the parameters of our individual departments.

It is difficult enough to attempt a project with a colleague from your own disciplinary area, so it might seem a bit daunting to attempt this with someone outside your department. Perhaps as you are reading this book you are formulating an idea for the type of interdisciplinary project or class you would like to create. But finding the right collaborator is equally as important as the concept that will serve as the foundation for the course. Will you and this other person even “speak the same language,” as in a shared vocabulary that can serve to help bridge any disciplinary differences? What if you don’t have any idea of whom to collaborate with on your campus? Chances are, you may not get many opportunities to meet your colleagues from other departments to find out what their outside interests might be. We can assure you that becoming an expert in a second disciplinary area is not the most viable solution.

In fact, when Gena submitted a proposal to develop her licensure preparation website, she had no clue who would be the best person to work with on campus. The director of technology services for our university system suggested several people to contact. She was able to zero in on Jesse based on feedback from colleagues who knew him. After several phone conversations, she realized his love of music and continued interest in singing in a barbershop chorus would most likely result in his having a basic understanding of musical terminology and concepts that would be beneficial to their ability to communicate across disciplines. As if scheduling class times and meeting times aren’t difficult enough, there are many communication issues that can arise by not always having a common technical language and symbol system where meanings and interpretations don’t get misconstrued. Therefore, between Jesse’s cursory knowledge of music and Gena’s rather limited understanding of programming, Gena believed there was some common ground between them.

We would like to stress here that our collaboration is one that developed over time from the ground up based on our shared interests and perceived needs. There may be instances where institutional need may necessitate the creation of interdisciplinary programs and/or teams by administrative design. However, Lindman and Tahamont [[3](#_ENREF_3)] caution that faculty are often resistant to curricular reform when it is imposed from the top. In those cases, there is the risk that each of the stakeholders may not be equally invested in the outcomes of this work. In our own experience, our collaboration came about based on projects we were each interested in exploring. As such, we feel we are totally invested personally and professionally in the outcome of this work. Yet ironically, without the support from the administration, many faculty-directed initiatives may not be sustainable. Being able to articulate why this work is important and learning how to communicate this should be high on your agenda. Therefore, a good piece of advice is to work equally as hard promoting the benefits of your project or course to your supervisors, students, and professional community, as you will in creating and sustaining it.

## Why the GenEd Course Model?

Colleges and universities are not training schools. Virtually all 2- and 4-year programs at U.S. colleges and universities require students to take courses outside their majors to ensure that they receive a rounded education. Such courses are intended to prepare students to become educated members of the “community of scholars,” to which college presidents often welcome them at graduation. At many universities, including ours, these are referred to as “General Education” courses, which are commonly shortened to “GenEds.” The official statement on our GenEd program’s website states: “The General Education Program at UMass Lowell fosters active learning by asking students to think critically, communicate effectively, and embrace cultural diversity” [[11](#_ENREF_11)]. What better description is there than that for what we try to do in our interdisciplinary courses?

Most colleges and universities with GenEd programs require a mix of courses. At UMass Lowell, all GenEd courses fit into one of three categories [[12](#_ENREF_12)]:

* Arts and Humanities
* Social Science
* Science and Technology

Within these categories, some courses are designated as satisfying the university Ethics requirement and some as satisfying its Diversity requirement. Different departments require different mixes of these courses for their degree programs. Our Music Studies program, for example, requires three courses from each of the three categories. Our Computer Science program, and most other science and engineering programs, require three courses from each of the first two categories, since science and technology forms the core of the courses students take within their own majors.

With most programs packed to the gills with required courses, there is very little opportunity for students to take elective courses that don’t necessarily satisfy some requirement toward their degrees. For this reason, we felt that it was critical to get GenEd approval of our interdisciplinary course so that students who took it would not only get three credits, but they would get GenEd credit as well, further enticing them to enroll. GenEd status also got our interdisciplinary course listed on the university’s GenEd website, making it easier for students to find it as they combed that list for courses to fulfill their GenEd requirements.

But where do interdisciplinary courses fit in a GenEd program? Learning about music doesn’t “round out” the education of music and other arts majors, and learning about computers doesn’t “round out” the education of computer science and other science and engineering majors. The key argument we made to the GenEd committee was that the *interaction* between students from different majors *itself* fulfilled the purposes of GenEd courses. We argued that the interdisciplinary classroom, as well as requiring students to work collaboratively with their peers from other majors, fostered an environment which directly supported the stated purpose of our GenEd program: to get students to “think critically, communicate effectively, and embrace cultural diversity.”

The university GenEd Committee didn’t refute our claim, but they still didn’t feel it was enough to warrant GenEd designation. In addition, they didn’t know where to put our interdisciplinary course on the list. Was it mostly an Arts and Humanities course, or was it mostly a Science and Technology course? And if students from different majors worked together on projects, wouldn’t the arts majors do all the artsy work and the science and engineering majors do all the computer work?

These were tough questions to answer. Fortunately, however, we were able to “stand on the shoulders of giants.”[[1]](#footnote-1) Our colleagues in Art and Computer Science had successfully won GenEd approval for their interdisciplinary *Artbotics* course, which explored the intersection of art and robotics [[13](#_ENREF_13)], by co-listing it in both the Art and CS departments. Following their lead, we proposed to co-list our interdisciplinary *Sound Thinking* course in both the Music and CS departments. In this way, arts students who wished to earn Science and Technology GenEd credit could register for the course using its CS Dept. number and science and engineering students who wished to earn Arts and Humanities GenEd credit could register for the course using its Music Dept. number. That approach, plus our guarantee to the Committee that science and engineering students would indeed be required to work with music, and arts students would indeed be required to do some programming, won the day.

With this arrangement, enrollments in our interdisciplinary course have grown from 14 to 20 to 29 to 34 in the four years that it has been offered so far. We believe that the co-listing approach is a powerful one not only for attracting students, but also because it reflects the true interdisciplinary nature of the course itself.

## Teaching Diversified GenEd Students

When we first offered our interdisciplinary course, Gena had never taught science and engineering majors, and Jesse had never taught arts majors. We weren’t sure how we would connect to them or whether the techniques we used with our own majors would work with students in other majors. As described in this and other chapters, we therefore tried to devise a number of activities that we thought would simultaneously interest students from all majors, lend themselves to collaborative projects, and reinforce the concepts we were trying to teach.

Our class was highly diversified with respect to knowledge of music and knowledge of computing. We didn’t want to go so fast with either music or computing concepts that we lost those whose expertise was in the other area, but we were also worried about going too slowly and boring some students as we introduced concepts that they had already mastered.

We therefore used several techniques to connect with as many students as possible in every class.

(1) We scheduled the class for two 75-minute meetings per week rather than three 50-minute meetings. We have a big campus separated by a river, with most arts classes on one side of the river and most science classes on the other. Thus, one faction or the other would have to make the trip across the river and back for each class. By scheduling two classes per week rather than three, we cut out 33% of the students’ travel time.

(2) We kept lecture to a minimum, adopting more of a “studio approach” to teaching. The longer 75-minute classes were instrumental in making this approach work, as they gave us time to introduce a concept, work with students either individually or in small groups on an activity related to that concept, and then end the class with “performances” of student-created works and discussion that revisited the concepts being explored.

(3) We adopted a “spiral teaching” approach [[2](#_ENREF_2)], discussing topics at different levels with different students and at different times. This helped keep everyone engaged. As an illustration, consider the Scratch [[5](#_ENREF_5), [6](#_ENREF_6)] programs in Figure 7‑1. All of these programs play Jimmy Page’s famous guitar riff from Led Zeppelin’s *Kashmir*. The code in Figure 7‑1a works properly and all students, regardless of background, are able to grasp the concepts of setting the instrument to be played, setting the tempo at which to play, playing a note, and looping forever.

Even on the first day that we introduce Scratch, however, many students — including many non-science majors — are able to understand how the code in Figure 7‑1a can be transformed to the version in 7‑1b and then to 7‑1c, and that each of these programs plays exactly the same riff.[[2]](#footnote-2) But rather than trying to explain all the concepts involved to the entire class, we get them all to the point that they can start to code a song of their choice and then work with students individually and in teams to enhance their own work.

|  |  |  |
| --- | --- | --- |
| Kashmir-v1 |  |  |
|  | 7‑1b |
|  | Kashmir-v2 |
| 7‑1a |  | 7‑1c |

*Figure 7‑1.* Three versions of Jimmy Page’s *Kashmir* riff programmed in Scratch. [[7](#_ENREF_7)]

## The Communication Factor

Communication is crucial to any collaboration. Although we touched on this in Chapters 2 and 4, we can’t stress enough the importance of communication throughout the entire process. As mentioned previously, Gena has been involved in multiple interdisciplinary projects and the key to the ones that were successful for both students and professors was the ability to maintain a constant two-way communication stream. Syncing your schedules will improve your ability to meet and interact regularly. Gena found through trial and error that meeting a like-minded professor and having a great interdisiplinary project idea for her students is only one piece of a more complex puzzle. We are fairly certain that if you’ve ever tried group projects with your students, you understand that groups that lack a strong communication ethic via phone, email, or actual in-person meetings have outcomes that are often inconsistent. If this can occur with students who are in the same class, think about how the odds will be stacked against your students if they are not given an opportunity to meet with their counterparts as part of the class. That situation will ultimately create an environment of futility and resentment amongst your students.

Given the social networking and collaborative tools available, it is entirely feasible that you can just as easily find yourself attempting a collaborative endeavor with a colleague from another institution as you would with someome from your own. In fact, we believe that inter-institutional collaboration will someday be the norm.

Therefore, you and your colleague need to prioritze scheduling changes at the outset or your students will have a great deal of difficulty finding a common time outside of class to meet with their group mates from the other section (or institution). In comparing both experiences, one student who worked on an interdisicplinary project where Gena and her colleague couldn’t find a common meeting time, as well as Gena and Jesse’s synchronized project, made the following assessment of the first experience: “But that was just a nightmare and I don’t even want to think about it.”

For our synchronized classes, there was a one hour window when Jesse’s and Gena’s class overlapped. We are certain that our ability to meet on a regular basis as a large group was a contributing factor to the success of this project. Our students did not experience frustrations due to lack of communication as the following student comment attests:

We were introduced to the computer science majors from Jesse’s class this week. I think that the class had mixed emotions about this. A lot of people are weary because of the project that we did in Technology class with the art students. Although those projects were disastrous, I feel that this time we have more support from the professors involved and that the CS students are more into the idea.

Consistency is another area you and your colleague must work out through communication. There needs to be a consistent set of guidelines for both groups of students regarding due dates and grading policies. In our first synchronized project, the CS students needed the graphic notations from the music students before they could proceed with their part of the project. If Gena or Jesse needed to change a due date for their students, they needed to first discuss with each other how that change would impact the other students. Chapter 4 mentioned that our interdisciplinary project was one of many projects in the music class, but represented the final project for the CS students. It is critical to communicate with each other about what part of the grade this project constitutes. As you can imagine, grading becomes more complex within a project environment between two disparate classes than within an integrated course. In situations where the assignment isn’t equally weighted with regard to the percentage of the grade being affected, the grading issues can be problematic if both groups are not equally invested in the outcome. Creating a project that is intriguing to both sets of students that provides learning outcomes benefitting both your disicplines will promote “buy in” for all involved. This comment from one of the music students gets to the core of why we attempted this project in the first place:

I like how the project has benefits for both sides. It allows us to be able to think back to the beginnings of notation and to be able to communicate our ideas with little to no explanation to people who have no musical background. For the CS students, they get a taste of what it is like to work for a client and to interact with people to give them a final product that is efficient.

There is another big picture communication issue you need to consider before embarking on interdisciplinary projects or courses. What if you and your colleague discover you have completely different philosophical views towards grading? What effect will that have on members of your class and their perceptions of how they are doing? It is important to discuss this early on in your planning process. If you don’t, you may be as surprised at what develops as we were midway through our first semester.

You see, while Jesse and Gena discussed many aspects of creating this course, this particular discussion never happened. To be fair, when Jesse created a formula that ranked students based on the average of their project grades, Gena didn’t even think about the consequences to her students. So in addition to being able to see how many points they earned toward their overall final grade, students were also able to see where they ranked in comparison to the rest of the class. Jesse created a password protected link on our website where students could access their individual grading information for this course, including their ranking.

This seemed harmless enough, and on the surface it shouldn’t have been a big deal. But if there are 15 students in a class, barring any ties, there will inevitably be one student who is on top and one who is on the bottom. Now it might be that the student on the bottom is separated from the students on the top by perhaps a point or two. However, if you are the student who is ranked number 15, you are going to be fairly upset if you believe you have been working hard and doing good work and you have these grades in front of you to prove it. Particularly if you are a student from a program that doesn’t stress rankings, such as our music program. Consequently, midway through the semester we had a near mutiny. It was a teachable moment for both of us, in that just because the technology allows you to do something, does it mean that you should? We still post a link for students to access their grades for all their assignments, but we have disabled the ranking feature. As you can see, when you embark on interdisicplinary work, you need to filter your work, processes, and procedures through multiple lenses.

## How to Begin: Project or Course?

### *CT as a Foundation for Interdisciplinary Projects*

There are many commonalities and differences between creating an interdisciplinary project vs. an interdisicplinary course, so let’s start with the simpler of the two: the project. You may want to each take an inventory of the types of projects you currently do in your classes and think about ways each project could be extended to include aspects of the other person’s discipline. Think about what concepts each project may share in common with particular emphasis on how this project could support the development of computational thinking. As outlined in Chapter 4, we began with the Found Objects project mainly because we believed it began on more or less a level playing field that didn’t advantage one group of students over another. It was not necessary to know anything more about music than how to explore an object for its sonic qualities and then create a series of patterns using the sounds this object makes. No formal musical knowledge is necessary. Nothng more is needed than one’s ears and intuitions regarding how to do this. In fact, this activity served as a warm-up exercise for the two groups of students to get to know each other without having to step completely out of their comfort zones. The following sentiment sums up the general feelings of both sets of students with regard to the way this project unfolded:

I enjoyed seeing everyone’s found objects and I liked the fact that the CS students brought their own objects, too. We seem to already be meshing well and I am looking forward to the rest of the project…

At this point you might be thinking, “Nice project, but what does that have to do with computational thinking?” However, if you were to take an inventory of the kinds of thinking involved in this activity, you would come up with a fairly long list. On the music side, your students will be involved in some serious aural analysis through making decisions about timbre, rhythm, dynamics, form & texture, not to mention the performance aspect. For the creative notation part of the project, your students will be involved in visual analysis and some serious decision making regarding symbolic representation. The CT involved in these musical decision-making processes involves your students in temporal structuring, pattern recognition, the beginnings of procedural thinking, and categorizing.

The creative notation part of the project was where we felt the music making and computing could intersect the interests of both sets of students in a natural way. Both disciplines rely on a unique symbol system that is used to create and perform. Jesse’s mind immediately gravitated toward the creation of some kind of notation software. He would have his CS students use the music students’ invented notations to create a notation-like software application. From a CS perspective, his students would be required to create a project using lists and drag and drop commands, to name just a few of the computing concepts covered. It would also highlight the difficulties inherent in translating a two-dimensional graphic symbol system meant to repesent musical sounds into a functional, user-friendly multimedia software application. As our students found out, there are certain conventions each discipline takes for granted, yet we shouldn’t assume others will as well. For example, as with reading a book, we read a musical score from left to right, not right to left, up to down or randomly, unless of course this is a contemporary piece defying traditional musical conventions. But these are all cool features a computer programmer could make happen. They can make the random boxes light up, too. Who wouldn’t want that, right? One student came to this realization with how his composition was being interpreted by one of the CS students with the following comment:

It is good for me to see that people don’t immediately understand what I am trying to portray. This way, I know that I need to have a form of communication that everyone will understand, rather than having others do the work to understand me.

Once again, issues of communication become paramount. Whether we are going to be teachers, musicians or programmers, we need to be clear in our directions and intentions.

# Beginning an Interdisciplinary Course

It’s one thing to decide as individual professors to collaborate with a colleague in another discipline on a project. Once the decision is made to expand your scope to an entire general education course, however, all kinds of questions will begin to surface. Can you obtain the needed approvals from your individual departments, the college general education committee, and possibly your faculty senate? In our case, being supported by an NSF grant was helpful for our initial offering of the course, but could we sustain this and justify to our deans that having two faculty members in one classroom was critical to the success of the course? There are ways to make this work even without a grant, but first there are some basic questions that need to be addressed regarding the rationale for offering the course in the first place, the goals and objectives of this course, and an overall outline of what you think you can accomplish. If your university’s GenEdCommittee is like ours, you will also need to address how your learning outcomes satisfy the requirements for GenEd courses with regard to breadth of knowledge, critical thinking, and development of clear communication skills.

For breadth of knowledge, we felt that the course would help students grasp the relationship between organized sound production and its digital representation. It would also help them learn to use new tools within a context that is relevant to their needs and interests, explore problems, imagine possible solutions, express their ideas, observe, reflect and stretch their thinking beyond “right” and “wrong” answers. For critical thinking, we believed students would be challenged to draw connections from their own major to other areas of study. They would need to solve problems in a manner that makes sense to someone else, and not necessarily from their own perspective. We hoped that they would begin thinking of solutions through the lens of another discipline. We felt that putting an emphasis on reflective journals in which they analyzed problems in music and technology as well as working in groups and being responsible for in-class presentations supported the development of communication skills.

If, like us, you do not usually teach GenEd courses, the big stumbling block will be in making the transition from thinking about how to create discipline-specific projects with defined sets of domain-specific knowledge tohow to create ones that are more broadly based and appropriate for GenEd courses that are open to all students at all levels of achievement. All projects need to be designed so that anyone, regardless of their major or educational level can succeed. Another issue is whether you will require any prerequisites for your course. Since our course was designed to encourage reflective journaling and dicussion forums, we both believed the students should have taken and passed our university’s two required core writing courses before enrolling in *Sound Thinking*.

## Course Structure and Challenges

Writing the course description is actually an interesting exercise in creating a succinct description of what your course is about, but sitting down to develop the course structure is where you and your colleague will begin to wrestle with the fine details. Where do you begin the class and where do you want it to end up? How will it be structured? What concepts do you wish to cover and what types of projects will you create to address those concepts? What software will you use? Will the class be taught in a computer lab or in a regular classroom using individual laptops? And last but not least, in whose department/building will the course be offered? Once the starting and ending points are mapped out you can create the rest of your projects to scaffold the concepts needed to get successfully from the beginning of the course through the final project.

*Note to Editor*: We will provide some kind of skeletel inventory of the various projects and how they build on each other and promote CT in an appendix.

Another factor affecting how you structure your class is your software decisions, which is no small matter. Before you can even begin to think about how to stucture the semester, you need to address the software programs you will be using. As we discuss in Chapter 6, in a discipline-specific course geared toward teaching majors, there are certain software applications that you would expect your students to purchase as part of their coursework. However, it is one thing to require your majors to purchase a specific high end software application and quite another to ask that of a non-major. We did not feel that it was right to make it all but impossible for students to complete their assignments unless they either purchased a specific software package or were tethered to our departments’ computer labs. After laboring for weeks researching inexpensive software options that could closely replicate some of the more expensive programs we were considering, we had an epiphany of sorts. Using programs that were freely available online, as explained in Chapter 6, we could teach broad concepts in digital audio and computing that could serve as a foundation for working with the higher end programs with more bells and whistles.

Once you know the tools you will be using, you can begin to zero in on the structure of the course and start to define the concepts and projects you will develop. Do you introduce one discipline at a time and, if so, which one will you start with? Or do you keep both intertwined throughout? In our initial offering of the *Sound Thinking* course, we envisioned the semester being split into three phases. Phase 1 would concentrate on Digital Audio and Phase 2 would concentrate on computer manipulation, which would culminate in Phase 3: the integration of audio and video into a dynamic web application. We then drew up a project list (see appendix) that encompassed concepts we wanted to teach. Our Phase 1 covered form, file formats, graphic notation, sound waves, noise reduction, backing up, copying, layering/mixing, panning, compression, and effects processing. Our Phase 2 covered looping programs and simple webpages, code-driven web pages, and processing user input. Phase 3 dealt with synchronization and integration.

Feedback from our students after the first year suggested that they wanted greater integration throughout the semester. They wanted more hands on programming experiences. Each semester we teach the course we still consider it a work in progress. Needless to say, the structure of our course today is vastly different from our first offering. Based on feedback and experiences of our Performamatics colleagues S, Alex Ruthmann and Fred Martin, rather than having students develop interactive web pages, we are finding a greater ability to integrate music and computing through *Scratch* as described in Chapter 6. We still begin the course with the same project, but we get into the computational thinking concepts almost from the beginning. You can find our current project list and syllabus at http://soundthinking.uml.edu. As you can see there are multiple ways to structure an interdisicplinary course that integrates two disciplines.

Since this is a project-driven course meant to promote colloboration between non-like-minded thinkers, we think it behooves us to have a brief discussion of how we deal with setting up collaborative groups for this class. Using the class roster we try to pair students from disparate majors and rotate the music and CS students through a variety of partners so that at some point everyone has the benefit of working with someone from each of the majors in the class. At the beginning of each project, Gena creates a list of pairings that we post on the class website. Even with the Found Objects project, which is an individual project, students are paired for the presentation part.

You will find that there are students who are open to collaboration and there are others who will try every conceivable excuse to get out of working with someone else. We can’t be there to police their interactions outside of class and force them to get together, so we make sure to build in time toward the end of each class to allow the pairs/teams to meet and plan. During a given project, we also encourage groups to sit together in class.

Control is also a constant issue: who likes to have it and who is more than happy to let others make decisions for them. Therefore, we also try to mix up the Type A personality types and not always pair them with a non-Type A person. Putting two or three people together with similar personality types will necessitate a different approach to working on a project. Not every pairing will work out, but we think that that replicates real life: you need to learn to work with all types of people, be willing to listen to other people’s ideas, and be able to compromise.[[3]](#footnote-3)

## Stylistic Differences

At conference presentations, Gena often introduces us using a reference to an old Macintosh commercial when she states that she’s a Mac and Jesse’s a PC. To the technology savvy folks attending these presentations, that short phrase immediately signals our different ways of thinking and teaching.[[4]](#footnote-4) In addition to philosophical differences on grading our students, not surprisingly we have different approaches in the classroom. Jesse will outline a problem that needs to be solved and meticulously take the students step-by-step through the solution. Gena, on the other hand, is more discovery oriented. She would rather set up a project and give the students time to explore a particular software program to figure it out and learn how it works. Actually, many students in her technology classes have described it as more of a “sink or swim” methodlogy, though students rarely “sink.”

These differences even affect how and when we post class notes. In a typical Jesse class, he will have detailed notes available for his students to see before class, so they can walk into class and hit the ground running. In a typical Gena class, the students won’t be given much information beforehand, but there will be an extensive amount of student reflection after the fact to unpack the various thought processes and procedures that were uncovered through their class activities. A perfect example is in how Gena conducts her Global Music Pedagogy class. The syllabus will not give students any idea of where in the world they will be musically, from one week to the next. At the beginning of class the students will listen to several pieces of music to figure out what culture the music is from, what about the music makes them think that, and what musical element(s) might perhaps be consistent with the culture they explored the previous week.

One style is very lecture based, albeit a very engaging and informative lecture. The other is very much in a constructionist mode with hands-on activities that foster inquiry and discovery. By now you are probably wondering how we can possibly make this work, yet it does.

We have found that as with most things in life, it’s all about balance. Before Jesse posts any notes on the web we discuss what can safely be revealed before class and what should wait until after class. Because so much of the class involves working in groups and working with software and concepts that might be unfamiliar, we spend the beginning third of the class discussing new concepts and leave two-thirds of the class for exploration, questions, and working with one’s partner. Even the more lecture part of the class has become more interactive, where we pose more questions that allow students to make some educated deductions based on what they are learning.

Depending on who is doing the lead teaching, we can act as each other’s assistant when wanting to demonstrate a particular point. For example, when Jesse wants to demonstrate a certain procedure for creating a loop, he will pose the question to Gena to come up with a solution. As we have mentioned in previous chapters, there is a great deal of bantering that goes on between the two of us. Jesse may make a statement about a particular procedure and Gena will pepper him with a great many “what if” questions and vice versa. Or we may challenge each other in front of the students. Not in a malicious manner, of course, but in that respectful probing and questioning manner that we hope to instill in our students. It is difficult to become dual content experts and we are by no means suggesting that team teaching is not without challenges. Nonetheless, we have come to embody the notion that for integrating computing and music, two heads really are better than one.

## Aligning with Departmental Reward Structures

# *Defining What It Means to ''Publish''*

As we have often discussed with colleagues, there are different reward structures between those of us in the sciences and those of us in the arts and humanities. Those differences can affect how your work is perceived by those on promotion and tenure committees. This is not insurmountable, but you may need to provide additional documentation to your colleagues and perhaps have discussions with your chair and dean.

We’ve all heard the age-old academic cliché: “publish or perish.” To a professor in a science or engineering department, “to publish” means to get a paper accepted by an academic journal or a reputable conference, to get a manuscript accepted by a book publisher, or, in some cases, to be invited to give a prestigious lecture. To a professor in an arts department, the term “to publish” may involve a completely different set of criteria for a work to be considered valid by that college’s promotion and tenure committees. Instead, “publish” might mean to “perform” or “show.” The administration often looks to fine arts professors to perform musical works in prestigious venues, show their artwork in prestigious galleries, or have their words, images, or compositions included in prestigious books. On the surface, these differences may seem only semantic. But in practice, they can cause problems when two professors must follow different paths to move their academic careers forward.

One issue that can cause problems is the validity of multiple authorship. This is typical for those in the sciences, but is often questioned by those in the humanities. Having numerous articles list you as one of several authors is a common practice if you are a CS professor, but it will be seriously questioned by your colleagues if you are in the arts or humanities. Yet interdisciplinary work, by its very nature, will more often than not generate research papers by multiple authors.

Another publishing-related issue concerns the types of peer-reviewed journals that are acceptable. For example, some disciplines are more disposed to accepting online peer-reviewed journals than others. If you publish in a journal that is highly regarded in your colleague’s field, will that be acceptable to your colleagues within your department or college? At the time of this writing, there were few interdisciplinary journals for what we do, so it is inevitable that Gena will publish articles in computing journals and Jesse will publish in music journals. It’s always a good idea to sit down with your supervisors to help them understand what you are doing and for you to get a clear picture of what their expectations are for your interdisciplinary work and how that will impact your standing within your department.

# *How is Research Defined?*

Lastly, this type of work inevitably will blur the boundaries between teaching and scholarship. The definition of “research” itself is also problematic. Not only is this word open to different interpretations across disciplines, it is also defined differently by departments with the same name at different colleges and universities. In the sciences, the main question is whether research on, for example, computer science *education* is a viable research area for a computer science *professor*. Some administrations will answer yes, but others will answer no, taking the position that only research specific to the underlying principles of one’s field is appropriate for “counting” toward promotion and tenure. There are numerous examples of professors who are famous not only for their classroom teaching, but also for their educational, psychological, or other social science research on teaching (backed by numerous publications and presentations at educational conferences) who had trouble gaining promotions and tenure.[[5]](#footnote-5)

Developing, teaching, and sustaining a course such as ours can become a major research project. Since your students are your data sources, you are obligated to conduct your data gathering in compliance with your institution’s Institutional Review Board (IRB). One of the issues of concern to us personally is the importance of bringing the concepts we are exploring to the pre-collegiate level to impact teachers’ views of the interdisicplinary nature of computing and music. Research in the classroom is fairly common in schools of education, but less so for faculty in other disicplines. You may need to negotiate with your supervisors about the validity of the work you are doing.

# *The Value of Grants*

In the sciences and engineering, at least in departments at aspiring research universities, “publish or perish” has pretty much been replaced by “bring in external grant funding or perish.” Yet in the arts, sometimes even significant grantsmanship does not help one’s case for promotion and tenure. This is definitely a puzzlement when two professors try to do something innovative and interdisciplinary. Each has to lay out his or her goals for the work clearly and honestly to ensure that their support for the project is at least compatible, if not equal. Otherwise, the collaboration will be doomed to failure somewhere down the line.

As you may be aware, outside funding in the arts and humanities is scarce, highly competitive, and will most likely not be as financially lucrative for your institution as grants in the sciences. As a result, at our institution, bringing in grants is not required in the arts and humanities and not prioritized when it comes to assessing a candidate’s merit for promotion.

# Opening Lines of Communication

It probably goes without saying, but just for completeness we’ll say that the first step in avoiding the disconnects discussed in the previous section is to open all the lines of communication you can with your interdisciplinary partner. The Columbia Center for New Media Teaching and Learning discusses numerous issues involved in collaborative research, including “difference in style of investigators,” “difference in style of research across and within disciplines,” and even “ethical considerations [that] may affect research across institutions and nations” [[1](#_ENREF_1)]. But quoting Macrina [[4](#_ENREF_4)], they cite the very first of six “key components of a successful collaboration” as “communication first, second and throughout.” We couldn’t agree more.

Set aside a standard time to meet with your interdisciplinary partner. Your meeting might be face-to-face, over the phone, or via a service such as Skype that allows you to make a video call [[8](#_ENREF_8)]. The advantage of a video call if you can’t meet face-to-face is that it allows you to show each other things that you are working on. Skype even allows you to share your computer screens, but to do that we prefer TeamViewer [[10](#_ENREF_10)].

As mentioned previously, Gena’s and Jesse’s offices are on different campuses of our university, separated by a river. They are only 1.4 miles apart, but you really have to drive from one to the other. To avoid the hassle of having to go back and forth in a single day, we intentionally schedule our interdisciplinary class at 9:30 AM. Regardless of which campus the course is taught on, the early schedule means that both professors drive to the same campus when they first come to work in the morning. Although course materials and lecture notes are posted on the course website at least the night before, we meet for an hour before class to sort out any last minute details in the office of the professor whose “home” is on the same campus as the class. If there are no last minute details, we use this time to discuss grading, future classes, or anything else pertaining to the course or our collaboration. We then head off to class together.

If you can, we really suggest that you try to establish a similar schedule. This one has worked really well not only for us, but also for Jesse and another music colleague, Prof. S. Alex Ruthmann, with whom he taught *Sound Thinking* in semesters when Gena could not. The beauty of setting a standard time is that it establishes a “stake in the ground.” That stake can be moved, of course, but without having a standard meeting schedule, time flies by and your collaboration will suffer.

The web also provides an excellent communication channel. As noted earlier, all of our class materials are at soundthinking.uml.edu. This is of course good for students, but it is also good for us as professors, because when one of us posts the notes planned for a future class or a draft of an assignment, the other can easily and instantaneously review them and provide feedback to the other. Even if you don’t have the resources or expertise or time to create a website for your course, you can share materials instantly using one of the online services. We have already recommended Google Drive (drive.google.com) and described how we use that for grading, but one can also share regular files on that site. We also like Dropbox (www.dropbox.com) and use that rather heavily to share files even though our university also provides an internal application to accomplish this task. However you do it, we strongly encourage you to look for ways to use the Web to share documents easily and instantaneously to maximize the efficiency of your communication.

# Working with the Administration

We are fortunate in that our university administration has supported and encouraged interdisciplinary collaboration for a long time. We realize that this is not true at all institutions. As described in a previous chapter, *Sound Thinking* grew out of two prior interdisciplinary collaborations between Gena and Jesse, the first of which was funded by a small, exploratory grant from our President’s office.

We therefore encourage you to look for ways to start small. Try things out. Build relationships. And don’t be afraid to fail. Failure can be very educational, especially when you have the opportunity to analyze your failure and figure out just what the problems were. Every honest researcher will tell you that he or she had failures that preceded breakthroughs, and we are no exception. But one breakthrough can easily wipe away ten failures in this business, and the breakthroughs often grow out of failures through refinement of techniques that didn’t work. That is, don’t “throw out the baby with the bath water.” Instead, try to keep the good parts of your approach, figure out where things when wrong, and fix problems without sacrificing successful aspects of your course design.

And finally, seek external funding for your work. As noted prominently on our website, our work has been funded by two grants from the National Science Foundation (NSF). The first was from the CPATH program,[[6]](#footnote-6) while the second was from the TUES program.[[7]](#footnote-7) NSF programs come and go, but there are always programs that support educational research in some form. And of course, there are other funding agencies that support this type of work as well.

It is always nice, of course, to have funding to pay faculty summer stipends, hire students, support graduate studies, purchase materials, and support conference travel, but external funding actually gets you something that in some ways is even more important: legitimacy. If you’re in a science or engineering department and you can garner external financial support for your work, you have a much better chance of that work “counting” toward promotion and tenure and other measures of scholarly activity. And despite some instances to the contrary, the same is true in arts departments, although our experience is that the type of funding we have secured does not “count” *as much* in those departments.

There is no magic formula that is going to work in every department or in every college and university. You have to be aware of the situation at your own institution, and we encourage you to talk to your administration about your plans before investing the time it takes to get an interdisciplinary program off the ground. Clearly, there are areas where this interdisciplinary work can fall within the confines of traditional, discipline-specific research, but as we all move forward we are going to find that we are pushing the envelope as well. As we stated above, it is all about finding the right balance and how you go about “putting it together.”

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1. We believe that this phrase is most correctly referenced as being first used by Sir Isaac Newton in a letter to Robert Hooke written in 1676. [↑](#footnote-ref-1)
2. This sequence of successive refinements was developed in conjunction with our colleague S. Alex Ruthmann. [↑](#footnote-ref-2)
3. For more on group work and group brainstorming, see Sawyer, R.K. (2007). *Group Genius: The Creative Power of Collaboration*. New York: Basic Books. [↑](#footnote-ref-3)
4. At the time of this writing, Jesse did break down and purchase a MAC. [↑](#footnote-ref-4)
5. Back in the early to mid ’90s, when the World Wide Web was brand new and course websites were rare, Jesse published a number of papers on web development and its applicability to course websites. This work was not seen as CS research by his departmental Promotion and Tenure Committee because the journals in which these papers were published or the conferences at which they were presented focused on CS education rather than a direct subfield of CS. The work was therefore not considered relevant to an application for promotion at that time. One administrator simply wrote it off as “part of Jesse’s teaching duties.” It is interesting to note that the Association for Computing Machinery’s Computing Classification System added “Computer and Information Science Education” as subset area K.3.2 under “Computing Milieux” in 1991 [1]. [↑](#footnote-ref-5)
6. CPATH stands for CISE Pathways, where CISE stands for the Directorate for Computer & Information Science & Engineering. See www.nsf.gov/funding/pgm\_summ.jsp?pims\_id=500025&org=CISE, but note that this program is no longer active. The award page for our original grant is at www.nsf.gov/ awardsearch/showAward.do?AwardNumber=0722161. [↑](#footnote-ref-6)
7. TUES stands Transforming Undergraduate Education in STEM, where STEM stands for Science, Technology, Engineering, and Mathematics. See www.nsf.gov/funding/pgm\_summ.jsp?pims\_id=5741. The award page for second grant is at ww.nsf.gov/awardsearch/showAward.do?AwardNumber=1118435. [↑](#footnote-ref-7)