Interdisciplinary Collaboration: Connecting Computer Science and Music Students to the Benefit of Both

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Introduction

FaceBook. YouTube. MySpace. Blogs. LinkedIn. "It's not about staying ahead of the students, it's about keeping up with them, but without seeming desperate to be hip" (David Hawkins, director of public policy and research for the National Association for College Admission Counseling) [4].

The same philosophy that applies to attracting students to one's college applies to attracting students to one's major. Computer science (CS) enrollments suffer from "media portrayals of computing as stodgy and nerdy compared to other fields; an impression that computing requires extraordinary proficiency at math; uninformed high school counselors" [2], and other ills. To address these issues, some of our CS professors have teamed up with colleagues in the Performing, Fine, and Design Arts to revitalize courses by centering them around projects implemented by interdisciplinary student teams. This session describes the experiences of music education students who developed instruments from common household items along with notation systems for playing those instruments, and CS students who implemented those notation systems in Finale-like programs.

The work described in this session is part of a project funded by the National Science Foundation to revitalize undergraduate CS education (please see the Acknowledgments section for further details). To reflect our project's performance orientation, we call it "Performamatics." Despite the project's main focus on CS education, faculty in the arts and humanities perceive clear benefits to their students, since computing significantly impacts the creative process in their fields as well. Through Performamatics, arts and humanities students interact meaningfully with

students in a highly technical field, providing an excellent introduction to the type of people with whom they will need to work in their chosen professions.

Rationale

As new uses for multimedia applications are developed, it is quite likely that a computer scientist, visual artist, or a theater director will be involved in some form of project or work environment that incorporates music and/or sound design. From the perspective of an educator, a hands-on, interdisciplinary, project approach for learning to use technology would allow the music education students to gain first hand experiences in understanding the benefits and pitfalls of implementing -- and possibly designing -- technology applications in the classroom, with students who are growing up under the influence of media. From the perspective of the computer science students, they will gain first hand experiences in the use of digital audio as well as understanding the creative decisions musicians make and the emotional impact of music on the end user of any given application, regardless of whether the end result is a video or video game.

Gardner (1992) feels that formal musical training can "be the beginning of the end of most children's musical development" (p.38). He believes "the challenge of musical education is to respect and build upon the young child's own skills and understanding of music rather than impose a curriculum designed largely for adults [3] (p.38). Bamberger [1] proposes that even at the college level, students possess musical instincts that in the proper environment can be developed and nurtured. In addition to an increased emphasis on learning subject content, music education students need to learn to build upon children's innate musicality. Through the development of contextual teaching strategies that support meaning making, and cross-curricular connections, whether it's in a general music class, ensemble or technology lab, they learn how to engage students in critical thinking and problem-solving activities at whatever level they find their students. Our pre-service teachers need to experience and view music making from a child's perspective.

In this project our students will experience a real-world context for learning. The students will begin to recognize the interdependencies between sound, image, and technology. As the workforce moves to a more collaborative structure, it is important that students learn to work in groups with students who may not share their skill sets and levels of expertise, as they learn to problem-solve the myriad issues that arise when using technology. Such a class can break down the artificial boundaries of compartmentalized instruction that sometimes get in the way of meaningful and holistic learning.

The Found Instruments Assignment

The Found Instruments assignment is one that is generally assigned to the music education students in General Music Methods to help them experience acts of music exploration, intuition, creation, and composing from a child's perspective, before imposition of formal musical training. This project asks students to find typical household objects that can produce several

pitches or timbres. They are asked to design a musical instrument from these found objects and then create a musical composition that adheres to a common musical form. Once the composition is crafted, the students are asked to devise a system of creative notation that others would be able to understand well enough to perform, with little to no verbal or written direction. The notation system should not resemble standard musical notation in any way, shape, or form. Students will present their instrument and composition to a classmate to explore and perform.

For many students, learning musical notation can be an impediment to music making. Therefore, this project encourages music education students to think about the learning of a new symbol system from the perspective of a total novice. As one student pointed out in a previous semester, "... for students to truly comprehend standard musical notation, they must first create their own. Through that creativity and exploration, they will make the connections necessary to bridge the gap between their own creations and standardized music notation." Another student suggested that, "Playing other people's instruments really made us think analytically and creatively about figuring out how to 'break the code'." A third student likened learning notation to learning a foreign language when she stated, "I think we were asked to play each others' instruments so we could get an idea of what it feels like again to have to read a foreign language. When beginner students are asked to read music they are basically doing just that, and once the skill is developed can read fluently. The same goes with our compositions."

This project places both the music education and computer science students in the role of a novice having to intuit a symbol system, much the way children learn to read music or learn a new computer application. Concepts we educators take for granted as "obvious" due to our formal training may not always be easy to grasp and intuitive for many of our students and/or end users.

The second phase of this project asks the students to collaborate on a way to bring their instruments and notation to "life" in a computer-based environment. As the computer science students navigate their way through development of an application in a child-friendly graphic environment, the music education students will be devising lessons for incorporating this application into the teaching of notation, rhythm, pitch, or form.

The Computerized Notation Assignment

Computer science (CS) will attempt to create Finale Notepad-like programs that implement the music students' notation systems and allow others to write music to be played on the found instruments. The CS students participating in this effort are all enrolled in a course on graphical user interface (GUI) programming. This course is about using the rich capabilities of Java Swing components – particularly drag-and-drop and components such as menus, toolbars, drop-down lists, etc. – to create interfaces that are as easy-to-use as possible.

The ease of use goal is a critically important one. It is this goal that brings the assignment full circle back to the music students. As the CS students develop their programs, they periodically test their usability by having music students attempt to use them. Such usability testing provides

important insights into interface design that are impossible to gain by asking another CS student or professor to try to use the program. The interface must be tested with someone who is a member of the target user population. This is where most of the interdisciplinary student interaction takes place. In addition, repeated testing keeps program development on track and results in incremental improvement that eventually leads to a polished product.

We expect our presentation to include examples of students' found instruments and their notation systems in both manual and computerized formats.

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References Cited

[1] Bamberger, J. (2003). *The development of intuitive musical understanding: a natural experiment.* Psychology of Music **31**(1):7-36.
[2] Denning, P.J. & McGettrick, A. (2005). *Recentering computer science.* Comm. of the ACM **48**(11):15-19.
[3] Gardner, H. (1992). *Do babies sing a universal song?* In *Readings in Early Childhood Music Education*. B.L. Andress & L.M. Walker, Editors. MENC: Reston, VA. p. 32-38.
[4] Schorm, P. (2008). *Colleges turn to Web tools in hunt for 2008 freshmen*. The Boston Globe **273**(7):A1,A9. January 7, 2008.