

Competing with "Real Classes": The Value of Performing Ensemble Experiences for Non-Music Majors

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As an arranger/publisher for Hal Leonard and Dev Music Company, his marching/pep band arrangements have been performed before national audiences at Purdue athletic events and at a Bands of America Marching (BOA) Finals Exhibition Performance by the Purdue AAMB Trombone Section. Some of these arrangements are immensely popular on the Internet via YouTube.

Cox is in demand as a festival adjudicator, clinician, and conductor. He has adjudicated concerts, marching, and solo and ensemble festivals for the Indiana State School Music Association (ISSMA) and has served as a consultant and clinician in numerous Indiana schools and for music programs in the Metropolitan Nashville, Chicago, and Atlanta Public School Systems. Cox has conducted a number of groups, including the Lafayette (IN) Citizens' Band, the Kokomo (IN) Park Band, the Lafayette (IN) Symphony's Youth Orchestra, the Purdue University Wind Ensemble at the American Bandmasters Association 2012 Performance in Indianapolis, and he has guest conducted the Purdue Philharmonic Orchestra on their 2011 Eastern European Tour. He also has guest conducted at the Middle Tennessee State University and Auburn University Honor Bands, Indiana Bandmasters Association Regional and District Honor Bands, and the Mississippi State University Symphonic and Concert Bands, the Northern Illinois University Wind Ensemble, and University of South Alabama Symphonic Band and Wind Ensemble.

Cox holds professional memberships in the National Band Association (NBA), Indiana Bandmasters Association (IBA), Music Educators National Conference (MENC), American Society of Composers Authors and Publishers (ASCAP), Kappa Kappa Psi, and the Collegiate Band Directors National Association (CBDNA). He holds Honorary Memberships with both the Gamma Pi Chapter of Kappa Kappa Psi and Beta Sigma Chapter of Tau Beta Sigma (TBS) at Purdue University. He serves on the Board of Directors of the Lafayette Citizens Band, as faculty advisor of the Gamma Pi Purdue University Kappa Kappa Psi chapter, and as a member of the Committee on Ethnicity and Gender Issues with the CBDNA.

A native of Notasulga, Alabama, Cox received his bachelor's degree in music education from Auburn University and his master's degree is in music performance (euphonium) from the University of Alabama. He is currently pursuing a Doctorate of Arts in Wind Conducting with a secondary specialization in Euphonium Performance at Ball State University.

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Abstract

During the fall semester of 2013, the Band and Orchestra Department and Engineering Education Department at a large Midwest university launched an academic learning community to give all students enrolled in first-year engineering courses and in Band and Orchestra ensembles opportunities to obtain common academic experiences during their first year, to form collegial relationships with their peers, and to bond academically and socially via their passions for music. Data from the 2012-2013 academic year at this university displayed GPAs and graduation rates of engineering students enrolled in band and orchestra classes at the university (e.g., GPAs of the students who were not involved with band and orchestra and were studying engineering had an average GPA of 2.89, and engineering students participating in band and orchestra ensembles had an average GPA of 3.29). Within a four-year period, the student graduation was 45.2% for students who were not involved in band and orchestra and was 54.4% for students who were involved in band and orchestra.

In an effort to identify reasons that engineering students benefitted from being a part of the orchestra and band department, this paper presents findings within a new seminar to enhance and to encourage academic success. The study focuses on the connection of engineering and music via the development of leadership skills, academic success strategies, and service learning activities. The students completed an online Likert-scale utilizing a Qualtrics Survey at the conclusion of the course and elaborated on their individual experiences as both first year engineering students and musicians within the department.

Introduction

According to a Midwestern University Bands and Orchestra Department's 2012-2013 report of academic performance statistics, undergraduate students enrolled in band and orchestra ensembles performed at higher levels than all university students relative to GPAs across a variety of science, technology, engineering, and mathematics (STEM) Colleges at the university (Zehner 2012) (University Bands and Orchestras 2012-2013 Academic Year). Of the Band and Orchestra members, the largest percentage of students in the 2012-13 academic year majored in disciplines within the College of Engineering (44%), the College of Science (15%), and the College of Health and Human Sciences consisted (9%).

College	Average University GPA (58,985 students)	Band and Orchestra Average GPA (1,419 students)
Health & Human Services	3.11	3.30
Pharmacy	2.93	3.22
Science	2.91	3.12
Technology	2.88	3.12
Agriculture	2.79	3.19
Engineering	2.89	3.29

Table 1- Comparisons of Average University GPAs and Band and Orchestra Students' GPA (2012-13)

Given the promising connections between STEM and music, this paper presents results from first-year engineering student participants in an inaugural course representing a collaboration between the Band and Orchestra department and the College of Engineering at this same Midwestern university. Explored were the students' perceptions about the extent to which the course connected music and engineering and prepared them for future leadership opportunities within the Bands and Orchestra department.

Literature Review

Connections between the musical arts and engineering are not new. In a groundbreaking piece, Chandler (1956) wrote about the connections between engineering and music. Using sound musicians as examples, he identified the importance of sound engineers having the abilities to “speak” the language of musicians and subsequent difficulties that engineers face without having any musical background to work effectively with music and sound engineering materials. He also wrote about the need for engineers to learn musical terminology, to understand and to decipher the differences between high and low sounds versus loud and soft sounds, and to be familiar with basic musical elements such as form and musical periods.

Anderson, Todd, Burkett, Warren, Brown, and Cordes (2009) refer to the importance of impact between engineering and liberal arts programs, while Grasso (2002) notes that the integration of music and engineering has been occurring for numerous years. While Bachelors of Arts programs in engineering exist, Anderson et al. (2009) note that

engineers who are educated broadly and thoroughly are most likely to demonstrate understandings of the arts and to appreciate the role that the arts play in their educations. Despite his stating that the engineer's "knowledge of the equipment may be excellent, and his understanding of the material it is expected to handle may be virtually nil," (1956, p. 115). Chandler recognized the difficulties of engineering majors to engage with and to be involved in music-related activities. Other aspects of his article focus upon basic information necessary for an engineer to be successful in the sound engineering field. Although such tools can be learned in a music appreciation class, he highlights the distinct advantages for engineers to have lived experiences of the performance. Comparisons have also been made between musicians and engineers. Charyton and Snelbecker (2009) conducted a study to explore the comparisons and similarities of self-selected descriptors of male and female musicians and engineers and to measure creativity within both fields. Feist (1999) noted that, regarding creativity, the differences between engineers and musicians is that for scientists, discovery is external, and for artists, discovery is introspective. Artists and scientists were found to be aesthetic, creative, and open to experiences.

In summary, although music and engineering have been found to connect in numerous ways, new efforts are needed to explore what these connections look like in traditional engineering classrooms. The authors anticipate that this paper will add to the body of knowledge about novel first-year engineering learning communities and about ways to incorporate music in the curricula for students who have demonstrated interest in and skills to pursue music and engineering during their undergraduate engineering experiences.

Course Overview and Description

The one-credit seminar, ENGR 103 "Music and Engineering," is the primary course in which first-year engineering learning community enrolled in fall 2013. Housed in the College of Engineering and taught by faculty in the Band and Orchestra department, this course was one of three taken by students within this learning community. (The other two courses included a first-year Introduction to Engineering Course and an English course.) The seminar met once a week for fifty minutes on Tuesday evenings at 5:50 P.M. Course objectives for the "Music and Engineering" seminar were as follows:

1. Identify and understand the importance of music in our society.
2. Explain and demonstrate the connection of music and engineering.
3. Create an understanding of the university's rich history.
4. Demonstrate uses of campus resources to enable academic success.
5. Participate in service projects for the Band and Orchestra Department.
6. Explore opportunities for participation in student leadership positions within the band and orchestra department.

Within the course, students were expected to attend weekly seminars, to listen to speakers, and to engage in professional development activities. Speakers came from

university organizations such as University Libraries and the Writing Center. Speakers also included professors within the Band and Orchestra department, professors within the College of Engineering, a campus historian, a Resume' writing workshop, and upper-level students within engineering who were musicians within the department.

Students were required to attend a minimum of two different types of live on-campus musical performances that differed from the primary ensemble in which they were involved, and to reflect on those attended live performances. For example, if a student was involved with the orchestra, he would be required to attend a performance by a wind band or jazz band in the department. Students also had the opportunity to explore leadership and service opportunities informally and formally within departmental musical ensembles.

In addition to seminars and out-of-class activities, students engaged with a joint collaboration with the university's Audiology Department. Given the potential connections between music and the science of sound, an Audiology professor allowed Band and Orchestra students to engage in hearing assessments. This exercise resulted in students noting the importance of protecting their hearing from extreme decibels and from long periods of musical exposure without wearing appropriate sound protection.

Students also met individually with the primary instructor to share updates about their academic progress. During these meetings, the instructor was able to assess and to share tips on ensuring success through the first-semester challenges. Most of the students appreciated the individualized times with him.

Methods

Participants

Thirty-five first-year engineering students at a large Midwestern university were enrolled in the "Music and Engineering" course, and thirty-one completed the survey for this study. Seventy-seven percent of the students were male, and 23% were female. Of the 31 students, 6% were Hispanic and 94% were Caucasian and Non-Hispanic. Three percent of the respondents were international.

Since all students must complete general engineering requirements during their first-year of engineering, they were not affiliated formally with any engineering discipline at the time that they took the course. The following, however, were the percentage of students interesting in respective disciplines at this university: Agricultural and Biological Engineering 3%; Aeronautics and Astronautics 14%; Biomedical Engineering 7%; Chemical Engineering 3%; Civil Engineering 3%; Electrical and Computer Engineering 17%; Environmental and Ecological Engineering 3%, and Mechanical Engineering 41%.

The Learning Community was comprised of first-year engineering students who were enrolled in one or more musical ensembles in the Band and Orchestra department. Since some students were enrolled in multiple ensembles (listed below), they have been counted more than once. These ensembles and students' representation include Marching Band (48%), Fall Concert Band (29%), Philharmonic Orchestra (10%), Symphony Orchestra (3%), American Music Repertory/Jazz Group (6%), Jazz Lab Band (10%), Volleyball Pep Band (19%), Men's Basketball Pep Band (10%), and Women's Basketball Pep Band (26%).

Data Collection

Students were invited to complete a survey at the end of the class, which included a section of basic demographics including; ethnicity, gender, race, nationality and anticipated discipline choice. Students were asked to share which ensembles they performed in during the semester. Each student was enrolled in one of the following ensembles as a class these included; jazz band, marching band, concert band, and orchestras. The survey included open-ended and closed-ended questions. (One of the major survey questions included a 4 point Likert scale and the other included a 5 point Likert scale). Measures were taken to ensure that students remained anonymous and were not penalized for responding honestly to survey questions. The questions were designed to retrieve information about the students' experience within the seminar. These questions asked about the course objectives, benefits gained from the course, connections discovered between engineering and music, leadership development within the band and orchestra department.

Data Analysis

Given the low number of respondents, authors noted general trends across questions. Open-ended responses were read and grouped into themes representing students perceptions of the course.

Results and Discussion

The course instructor asked students to rate the extent to which they agreed that the course learning objectives (see previous section) were achieved. Figure 1 displays the results. The vast majority of the students strongly agreed or agreed that the course demonstrated uses of campus resources that would enable academic success and provided them with an understanding of the university's rich history. The lowest ratings, however, indicated that students did not participate in service learning projects and did not explore opportunities to participate in student leadership positions within the band.

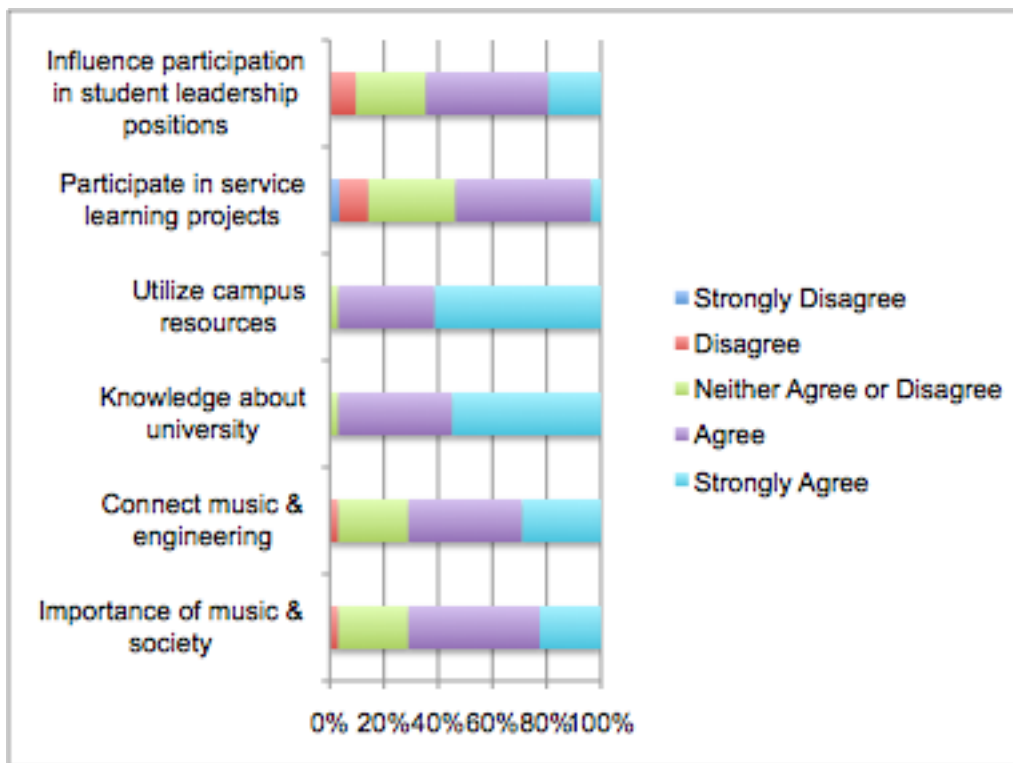


Figure 1- Alignment of Students' Responses to Course Learning Objectives (N=31)

In addition to rating the objectives quantitatively, students provided open-ended responses. Summary statements for several of the objectives are presented below.

- *Objective 1: Importance of Music in Society*- Students felt that there needed to be a stronger connection of the importance of music in society. Possible changes to addressing this concern include presenting information about ways that musicians influence society and bringing in speakers who have worked in music-oriented engineering fields
- *Objective 2: Understanding the connection of music and engineering*- Many of the open-ended responses provided insight about the quantitative rating of this objective. Among the positive comments demonstrating that students made connections between music and engineering include the following:
 - Students acknowledged that engineering students who are musicians can also excel in music and in engineering.
 - Students noted that musicians are creative and the engineering field requires some creativity.
 - Students mentioned that musicians and engineers have to pay close attention to details.
 - Students noted the team aspects of engineering and music.

There were several instances where students within the community wanted more explicit information about *how* to make clearer connections between engineering and music. Suggestions include forming more cohesive partnerships with faculty in the College of Engineering. An innovative activity in their introductory first-

year class included a design project in which they created musical instruments. Such an activity, coupled with debriefs in the seminar, might introduce students to career opportunities in the fields of music and engineering. Future plans may include student visits to an instrument design plant in the northern part of the state.

- *Objective 3: Creating and understanding of the campuses' history-* Only a few students mentioned this being an important part of their experience within the seminar. Much of the history learned within the course connected to the marching band and its history on the campus.
- *Objective 4: Demonstrate effective uses of campus resources for academic success-* Students stated that they benefitted greatly from the variety of speakers and resources at their disposal during the entire semester. In the open-ended responses, students mentioned that they most enjoyed hearing from other students in engineering and band, the visits from Purdue faculty both within the band and orchestra department, and a presentation by a professor from the College of Engineering who spoke about her personal experiences as a professor.
- *Objective 5: Participation with service projects for the Band and Orchestra Department-* Students wanted more opportunities for service learning projects within the seminar. It is important to note that the department has several avenues for students to serve the department, but the students desired something different based on the overall responses. The students wanted a personal project that they were responsible for the course of semester. The instructor, however, had concerns because of the heavy workload that students already were responsible for in their academic classes and within their performance ensembles.
- *Objective 6: Explore opportunities for leadership positions within the band department-* The majority of students have either taken advantage of being a leader or are interested in applying for leadership positions within the department. It is important to note that the marching band's structure is designed so that students are not only encouraged by their peers to apply for leadership but are surrounded by student leaders daily. Some of the other ensembles (fall concert band) possess student leadership opportunities and offer student-led instruction opportunities. This learning community might provide students with tools to develop their leadership skills and the confidence to engage in departmental leadership experiences.

Although most of the students agreed that the experience was beneficial, 20% to 60% of them noted that they would not seek out music leadership opportunities or seek membership in band organizations during their undergraduate experiences. Reasons for these responses included students' involvement in other extracurricular activities (e.g., ROTC, cooperative housing experiences), academic workload concerns, and no desire to take on leadership roles. Others mentioned that they would like to pursue a minor in engineering leadership or engage in other academic pursuits.

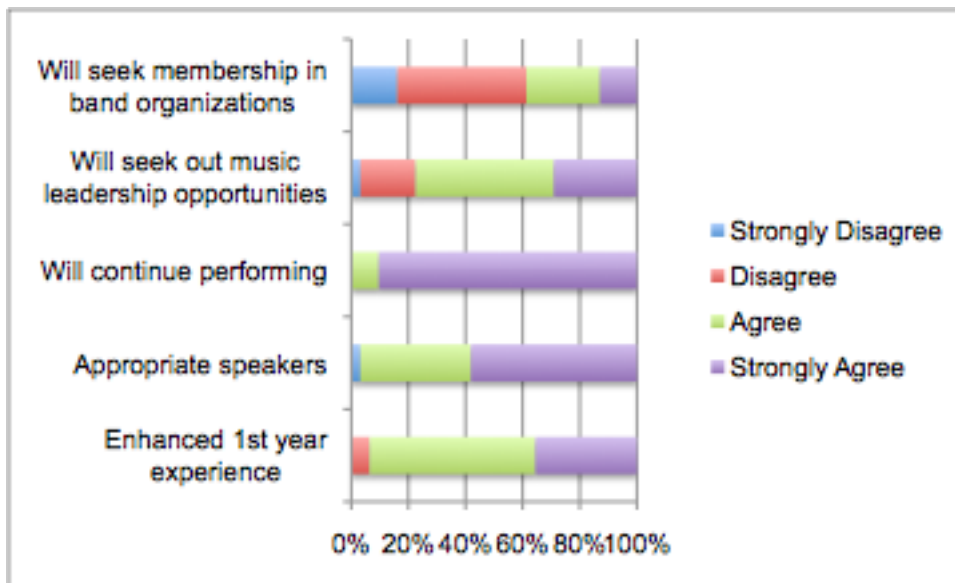


Figure 2- Additional Student Ratings of Course Experiences (N=31)

Conclusions

This paper confirms the connections between music and engineering. Over the course of the semester students noted that both music and engineering involve teamwork, critical thinking, academic excellence, creative thinking, and leadership qualities. On average, course learning objectives were met. According to students' responses, the learning community provided exposure to different types of engineers and aspects of music. Students received information about resources on campus, developed professionally, and learned about engineering from upper division peers and from professors with expertise in engineering and music.

Future improvements will include creating explicit and improved partnerships between the Band and Orchestra Department and College of Engineering; developing service learning opportunities that meet course goals within overburdening the students; and organizing a field trip to an instrumental manufacturing plant would allow the students to witness engineering and music connections via the design process. There are plans to continue this seminar with approximately the same number of students and to continue to enhance and develop the experience.

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