



Collaborative Learning

Enhancing the Undergraduate Research Experience

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Music has always united people through concerts, operas, and campfires. For two universities, music brings together undergraduate students despite 615 miles of separation.

Engineering students at Virginia Tech and the University of Hartford are working together on a music-inspired project that hopes to discover a new method for coating guitars. While this project connects the fields of engineering and the arts, it also yields benefits for students and faculty through collaborative learning efforts.

The Project

Seven years ago, Ms. Diane Folz (Materials Science Engineering (MSE), Virginia Tech) and Dr. Patricia Mellodge (Electrical and Computer Engineering, University of Hartford) worked together in the Microwave Processing Research Facility in the MSE department of Virginia Tech.

Sharing a love of guitars, Folz and Mellodge envisioned a guitar-based microwave processing project.

As ideas for the project developed, Mellodge joined the engineering department at the University of Hartford. Throughout this transition, Folz and Mellodge continued to research and visit guitar companies to learn more about guitar-building and finishing. Finally, they achieved success after Taylor Guitar Company enthusiastically agreed to work with them.

Taylor Guitars welcomed the collaboration. Matt Guzzetta, Senior Industrial Designer, stated that, “one great thing about experimentation is that you may discover something along the way totally unexpected.”

For Folz and Mellodge, the initial idea behind building a collaborative learning project was to work with undergraduate students. By combining the resources of each



Various guitar body sides are shaped using special heated platens. Here, they are stacked and awaiting backs and tops.

university, the benefits were endless. The University of Hartford has an acoustical engineering program and a lab in which vibrational testing could be performed on the samples made at Virginia Tech.

Dr. Bob Celmer, the director of the Acoustical Engineering program at the University of Hartford, became interested in working on the project and having his undergraduate students involved as well. According to Celmer, “the collaboration gives each group a unique perspective that is not achievable by any other approach. There are both synergies as well as realizations of the ‘bigger picture’, wherein both groups are the beneficiaries.” As a result, this opened up a huge opportunity for the Virginia Tech researchers who could now work with their undergraduate counterparts in an acoustical program.

Meanwhile, the microwave laboratory at Virginia Tech is unique in that this technology is not widely researched in academia. The Virginia Tech researchers are well-known internationally for their expertise in this area of materials processing. Additionally, the University of Hartford does not have a materials engineering program, so the participating students of both schools gain appreciation for other fields of engineering.

Why Work Together?

Embarking on a collaborative learning project produces many benefits for students, faculty members, and industries. It provides students with the opportunity to take their education to the next level and to see where their education fits into the real world of engineering and other fields. More so, the project provides the students with a broader perspective of their profession and improves their understanding of how the real world works, which ultimately

makes them better prepared to work as engineers after they graduate.

Mellodge states that, “the students get to see how colleagues who are working on the project contribute, but with a different focus. In any project, there are many aspects to it and different groups of people need to contribute their part for it to be successful.” As a result, students benefit from collaborative learning experiences through interactions with colleagues from different departments and disciplines.

Likewise, faculty members benefit in the same way. By working with colleagues from a different discipline, they expand their knowledge and breadth of understanding of real world engineering issues. This knowledge then carries over to improve their teaching and work on other projects. Folz agrees that, “despite [a lack of] funding, passion sparks collaborative learning and keeps the fire alive.”

Companies such as Taylor Guitars benefit from this collaboration because it increases the number of experts they have working on a research problem.

Lou Manzione, Dean of College of Engineering, Technology, and Architecture at the University of Hartford, agrees that Taylor Guitars benefits from this collaborative learning in today’s ultra-competitive environment. “Very few companies have the resources to conduct all the basic research they would like to do. It allows them to save time and money on an issue that they otherwise may not have the resources to pursue,” says Manzione.

David Clark, Professor and Head of MSE at Virginia Tech, believes that collaborations between universities and industry is essential. He states, “with technology making the world flatter and more competitive, we can no longer afford to work in isolation. Even if we could, we shouldn’t because the greatest strides in progress come when engineers and scientists from different backgrounds work together with industry to solve problems. Providing students with the knowledge and team building skills to do this is part of our university mission.”



Cary Hill, Chase Hammond and Charles Sprinkle with coated and cured guitar bodies.

By merging the resources of both schools and Taylor Guitars, “we can make better progress than any of us could individually,” says Mellodge.

Expanding the Vision

Virginia Tech and the University of Hartford are seeking funding to expand this research by offering a summer program that will explore all aspects of the year-long project. The student-mentoring-student summer project will consist of five phases:

1. A visit to Taylor Guitars in El Cajon, CA to meet with their designers and tour the facility
2. A week-long program at Virginia Tech where students will utilize microwave processing hardware to produce cured wood samples and characterize them
3. A week-long program at the University of Hartford where students will perform vibrational testing on the samples produced at Virginia Tech
4. A conference where students will present the results of their work to a professional audience
5. A week-long workshop at Purdue University where the students will gain firsthand experience of the entire manufacturing process by building their own guitars

According to Folz and Mellodge, this program will provide students with the opportunity to experience the entire design process by engaging them in several weeks of intense work on different aspects of the guitar finishing project. The goal is to improve the students’ understanding and broaden their perspective of engineering design and the manufacturing processes.

To learn more about how much of an impact the summer program would have on the students and the research, student and faculty travels already have begun. “We’re ready for our third trip to Taylor Guitars this June,” says Folz, “and we’ve already started student exchanges in a limited way. The Virginia Tech team traveled to Hartford last year, and this year, the University of Hartford students and faculty spent part of their spring break at Virginia Tech. Even though we are only just beginning to assess the effects this experience has on our graduates, the enthusiasm of the project alumni speaks volumes.”

On a practical level, Folz and Mellodge also hope to advance the project by having students work and make progress during the summer so that when the fall semester starts, the next group of students can pick up where the previous students left off.

Folz goes on to say, “By focusing on undergraduate research, we are able to use this collaboration as a learning tool as well as for generating new knowledge. By developing the transitional summer program, we are better preparing senior engineering students to hit the ground running after graduation, be it in industry or graduate school.”

About the Authors



Katelyn Webster is a senior English major at Virginia Tech. She graduates in May 2010 with a Bachelor of Arts degree. She enjoys Hokie football and Blacksburg in the fall.



Aimee Gervacio, an English major with a concentration in Professional Writing, will be graduating from Virginia Tech with a B.A. degree in May 2010. While at Tech, she was a member of Dance Company at Virginia Tech, serving on its Executive Board in various positions, her last being Vice President. After graduation, Aimee will be pursuing a career in technical writing and editing in the northern Virginia area.