

Artbotics: The Challenge of New Partnerships

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Presented at CITA International Conference on
Community–University Partnerships: How Do We Achieve
the Promise,
Lowell, Massachusetts, April 26, 2007.

Abstract

Community-university partnerships often focus on a subset of issues and disciplines: poverty, housing and disciplines such as education, health, and economics. Other opportunities for partnership remain untapped. Many funding agencies (the National Science Foundation, for example) have begun to focus on partnerships as a way to increase the success rates of programs aimed at recruiting underrepresented students into college. This paper examines a partnership that brings together new disciplines and new community partners including an art museum, an art department and a computer science department to use specific projects in *Artbotics* to involve students in ways that increase their likelihood of selecting computer science as a college major and career goal. This paper addresses the following questions: What are the challenges in creating such a partnership, one that brings together nontraditional partners? What kinds of challenges emerge as these partners attempt to work together in new ways? What are the implications for new and untenured faculty in becoming involved in community partnerships of this sort? How can the interdisciplinary opportunities enhance the integration of teaching, research, and outreach? What strategies work for assisting tenure and promotion committees to understand the value of partnerships such as this? What can art departments and computer science departments contribute to partnerships?

Universities have traditionally emphasized a disciplinary focus and allegiance. As universities change, they increasingly are turning to strategies for bringing disciplines together to develop new forms of knowledge and new ways to involve students and communities. This paper will situate this discussion within the pressing concerns of how to succeed at bringing nontraditional students into disciplines such as computer science.

Universities are in a period of change (Holland 2006). These changes include an increased emphasis on partnerships within and beyond the university (Maurrasse 2001; Silka 2006). These partnerships are often interdisciplinary in nature and bring together teaching, research, and outreach in new configurations. Not surprisingly, however, partnerships run contrary to standard practice in universities. Partnerships break down the walls of “the ivory tower” and integrate what previously has been regarded as separate and distinct aspects of faculty roles.

Calls for partnerships have begun to emerge from many quarters (Bringle & Hatcher 2002; Israel, Schulz, Parker & Becker 1998; Silka, 1999). Academic leaders are among those noting the many problems that cannot be addressed within the confines of a single discipline or without community partners (Kellogg, 1999; Walshok 1995). Policy specialists have also commented on the ways that the isolation of the academy has worked against universities bringing their intellectual capabilities to bear on contemporary concerns (Lerner & Simon 1998; Nyden, & Wiewel 1992). Those working in pre-college education have called for higher education faculty to become involved in efforts to find new ways to strengthen precollege education. Calls for partnerships have also come from public officials as they look to ways for public universities to play greater roles as “seed beds” of innovation for their regions (Walshok 1995).

Funders have also been important in calls for universities to work more effectively across disciplines and with those outside the academy. The National Institutes of Health have devoted considerable resources to funding partnerships that bring university researchers together with communities to solve long-standing health problems.

The Environmental Protection Agency has begun funding community-university technical assistance and problem solving partnerships. The Department of Education, through GEARUP and other initiatives, is championing partnership approaches to increasing college preparedness among disadvantaged youth. And the National Science Foundation, through programs such as the *Broadening Participation in Computing*, is funding partnerships that have as a goal to solve the growing problem of diverse youth not selecting computer science as a career goal.

Despite calls for partnership, many barriers remain to be addressed if partnerships are to become a standard way in which university faculty envision their roles as contributors to the intellectual mission of a university. This paper looks at those barriers in the context of an innovative partnership, *Artbotics*, that brings together faculty in several disciplines to work with museums and schools, with the goal of increasing the likelihood that diverse students will develop interests and skills in computer sciences, and at the same time the public will achieve a greater understanding of the integrated potential of art and computer science through the exhibits of the students. This partnership, now completing its first year, provides many lessons and raises provocative questions.

A Brief Description of the Artbotics Program and Partnership

The *Artbotics* Program (www.artbotics.org) is a three-year initiative funded under the National Science Foundation's *Broadening Participation in Computing* Program. Faculty members Hyun Ju Kim from UML Department of Art and Fred Martin and Holly Yanco from the UML Department of Computer Science joined together with arts leaders from the *Revolving Museum* in Lowell, Massachusetts to develop a program combining

art and computer science to enhance student interest in computer science. Program offerings include an array of academic year and summer activities for high school and college students offered during the school day and after school. Few structural elements were in place at the outset to support this program's implementation or partnership.

To implement this program, ways had to be found to establish working relationships among partners in the face of many barriers. University faculty from art and computer science were located in departments on different UML campuses. The community partner worked in yet a third location. In addition, the community partner's activities were organized around a different set of goals than those of the university and took place on a schedule that bore little resemblance to the semester schedule that drives many academic collaborations. And all of the partners were relatively new: the *Revolving Museum* had established itself in Lowell in only the last few years and all three faculty leaders were untenured.

This partnership had many decisions to make: What would a summer pilot program look like? Where would the program take place? How long would the program run? How would the students be recruited? Who would run the programs? What would the students do in the programs? What would be the roles of the various partners in the day-to-day operations? What would the academic year after school program look like? What kinds of undergraduate courses would be developed and would they be in computer science or art? How would these courses link to the program offerings for high school and middle school students?

These decisions not only had to be made, but procedures had to be created for the decision making that would need to take place throughout the partnership. And all of this

program planning and program implementation had to be accomplished on top of the very pressing responsibilities of untenured faculty and museum directors and staff.

Partnerships are often like this: their success depends on innovative problem solving in the face of too little time and too many competing demands (Silka, 2006).

In the remainder of this paper we look closely at the innovative problem solving within this partnership. We consider a number of key aspects of *Artbotics* that capture some of the challenges that must be overcome if community-university partnerships are to be successful.

Location, Location, Location

As those in the real estate industry are so fond of reminding all of us, success inevitably comes down to location. So too with partnerships. Sometimes it seems that partnering is all about the difficulties attached to being in different locations. The partnership literature rarely discusses this issue in detail but there are many examples of partnerships where difficulties with distance are at the heart of the struggle for effective partnership. In the environmental health arena, Quigley (ref) has discussed the challenges in a multiyear partnership seeking to communicate over long distances; in the partnership she describes, environmental researchers in Massachusetts were attempting to work with tribal nations located thousands of miles away in the western U.S. states of Nevada and Oklahoma. Silka (ref) consulted to a tribal partnership in Montana in which the partners struggled with designing a strategy for working with partner evaluators located many states away. But distances need not be large to create logistical barriers to partnership: a mere 50 miles between a university in western Maine and its partner high

school has been enough to create challenges to involving college students into the partnership (McCormick, 2007).

The *Artbotics* program provides an inside look into the difficulties of even small separations in location and how these distances can magnify the challenges of partnership. As noted previously, the *Artbotics* community partner is located in a congested downtown area whereas the university partners are housed on different campuses located several miles and a major river apart. Parking is scarce at all three locations; faculty are wary of vacating a coveted campus parking space at midday because of the inevitable difficulties they will encounter in finding parking upon returning to campus. Partner visits to campus are difficult because there is no dedicated parking for guests.

And then there are the students. Students are particularly constrained in terms of time and travel, and this can be especially so for the working, commuter students who make up the majority of students at an urban campus such as UML's. Like many campuses, UML has as a goal reducing the campus-community isolation by giving students reasons to come into the downtown. *Artbotics* offered the opportunity to further this campus goal. The *Artbotics* pilot programs in the first summer and fall took place downtown at the *Revolving Museum*. This location helped the students to better understand the role of the museum and to gain a sense of the museum's culture, but the faculty struggled with this off-campus location. Because several miles of congested roadway separated the campus from the museum, the faculty could not regularly drop in and observe the progress of the students. They also could not do what they might otherwise have done to publicize a program housed on campus: they could not make their

senior colleagues aware of the initiative by inviting them to take a moment to stop by and see the program in action. Advanced planning was needed for when the faculty would come to the museum. As a result, the faculty contact with the program took on a formality that was at odds with the off-the-cuff, informal contact that often underlies effective partnerships.

Other aspects of the program were also affected by the location. One of the hopes of the program developers was that the program would create opportunities for participants to interact in the lab with computer science graduate students. But the laboratory was on campus and the *Artbotics* students were downtown. Once the program moved to campus this kind of informal and serendipitous interaction did occur but, with the move to campus, contact with the museum staff and culture then became more limited.

This challenge of where to locate activities inevitably confronts community-university collaborations and has the potential to undermine partnerships (Jones, 2006). It is important to recognize that problem is not just one of access to programs but also concerns how a sense of ownership and connection to the program will be established and maintained. If the program is located on campus, the campus people may feel more of a sense of ownership; if the program is located in the community, the community people may experience an enhanced stake in the program's visibility and success. In other partnerships of which we have been a part, we have rotated the location of partnership events as a way to create shared ownership. Although rotations of this sort might appear to be viable solutions, we quickly discovered how rarely such changes in location work to build partnership. People with hectic schedules often start to get confused and struggle to

recollect where the next meeting is slated to take place. Instead of everyone feeling ownership, the end result too often is that no one does. Add students to the mix and varying the location becomes even more complicated and problematic.

Artbotics took a different approach to addressing this problem. In essence, the program used what people in the business world might call branding as a way to create ownership. The partners created logos and program materials that highlighted the common focus and shared ownership. And these logos drew on the shared skills of all three partners: art, computer science, and museum craft. Because of the shared branding, the separate locations for different parts of the program (college course, after school high school program) could be seen as connected and interlinked. Careful discussion among the program principals was also important. The *Artbotics* Team talked together about how best to use each setting: celebrations, exhibitions, and openings, for example, at the museum and classes on campus. To a large degree they were able to separate location from ownership.

How can the partnership connections be created and maintained? Consider online collaborations as an alternative model. The *Artbotics* program emphasized an online communications process in addition to the multiple face-to-face meetings. In the online collaborations a virtual location was created which could serve as a point of convergence for the partners. The online site became a place for faculty and partners to introduce ideas and suggestions, for the administrative team to discuss next steps, and for students to share their work and review course ideas and the work of others. This online model suggests many lessons for partnership collaborations.

Schedules, Schedules, Schedules

There is a growing literature that explores the difficulties for community-university partnerships created by differences in schedules. Academics operate on semesters. The rest of the world does not (at UML we further complicate things by occasionally turning Tuesdays into Mondays and the like to even out the course days across a semester). The partners have their own scheduling constraints. In an environmental partnership between state policy makers and academics (Hamin, Silka, and Geigis, 2007), the schedules of the state policy makers closely followed the election cycle. The policy makers knew that the partnership had at best only until the next election to create programs and demonstrate their impact. The apparent lack of understanding by university faculty of this timing constraint was often a source of exasperation for the nonuniversity partners. Most partnerships face these challenges in one form or another.

In the case of *Artbotics*, museum directors and staff organized their efforts around exhibitions and openings rather than in terms of semesters. And the scheduling difficulties were not limited to semesters. The challenges were equally as great concerning time of day. In deciding on the timing of the undergraduate course, there were many difficulties in identifying times when to offer an undergraduate course that included both a lecture and lab and that would require undergraduate students to go off campus to work with high school students.

What strategies overcome these problems? Through a great deal of discussion, the *Artbotics* team was able to identify a time (late in the day) that would allow for lecture, lab, and off campus work. Some of the initiatives happen on a semester schedule

and others do not. Some are built around an exhibition schedule but others are not. This solution remains only partially satisfying and continues to be labor intensive. The UML Provost has made the provocative argument that semesters should be eliminated altogether because they are outmoded and fit so poorly with the enlarged aims of an engaged university. But any such large scale changes at University of Massachusetts Lowell or elsewhere would be long in the future. Thus, small compromises are needed.

The *Artbotics* Team has learned that it does not work to simply draw half and half from a university and community schedule. Instead, inventive solutions are needed in which the schedules are organized to further the goals of the program. Perhaps, for example, the same approach does not have to be followed throughout an entire semester. The first half could be devoted to on campus labs which allow the undergraduate students to get used to the course and gives these undergraduates access to graduate students. During the second half the labs could be held at the museum near the high school and could emphasize service learning. The program could layer exhibition schedules over the semester, thus allowing students to get used to the museum culture and the real deadlines set by exhibition schedules.

A frequent complaint about partnerships is their tendency to become mired in process without ever reaching the stage of implementation or product creation. By bringing together a focus on product-driven exhibitions and courses, the *Artbotics* program was able to wed attention to process questions with progress toward particular outcomes. The exhibition deadlines, for example, forced attention to decisions about student artbotic products that would be highlighted at a public event at a set time in the future. Process discussions were tied to products.

Integrating Disciplinary Perspectives

The most productive areas of science, it has been argued, are those points at which disciplines converge over shared intellectual interests (cf. Dodge, 2001). New integrative approaches often emerge at these areas of intersection (Rosenfield 1992). Masters (1984) termed this positive marginality. Yet these points of intersection are not without their problems. Slatin, Galizzi, Melillo, and Mawn (2004) have written about some of the challenges that disciplines encounter in pursuing research together. Silka (2004) has described similar challenges in community-university partnerships. The problems are multiple: scholars from different disciplines rarely use the same language or approach issues in the same way. They rarely use the same research approaches. They may not even have the same view of what constitutes success in understanding a particular research problem. As a result, bringing together different disciplines is challenging in ways that have yet to be fully understood or addressed. These challenges revealed themselves in *Artbotics*, yet have become areas for innovation and problem solving.

A major goal of the *Artbotics* grant was to integrate art and computer science and, through this integration, introduce students to the rich variety of interdisciplinary activities available to those in computer science. But students participating in the first iteration of the program reported in their evaluations that they perceived the program emphasis to be more on art than on computer science. Since this was far from the intent of the program planners, the question became one of is how the students ended up with this perception. It turns out that achieving the artistic goals took students longer and posed more technical difficulties than did mastering the computer skills needed for the

artbotic exhibit pieces envisioned by the students. Students had access to programming materials such as Crickets that were designed to make the programming experience accessible to students new to computer science. No similar learning devices were available for the art part of the artbotics creation. For a second exhibition during this same period, the students were asked to focus their artbotic exhibits on water, with the intent that their efforts would be linked to Lowell's Southeast Asian Water Festival. The unintended consequence of this emphasis on water was that the students spent much of their time struggling with the technical difficulties of how to make robotic elements viable in a wet environment and less of their time was spent learning new programming skills that emerged in the rich artbotics context.

The point of describing these examples is not that other programs will face the same problems as found here; rather it is to point out the difficulties in any kind of interdisciplinary initiative of getting the balance of emphasis and effort right. If interdisciplinary endeavors are to become productive learning environments for students, faculty, and community partners, then attention must be paid to the multiple levels at which balance must be achieved.

Another goal of the *Artbotics* demonstration project was to create a hybrid general education course that would cover both art and computer science. The aim was to design an introductory course that would be open to all majors and that could be taken for academic credit in either science or humanities. Science students would be able to take the course as a humanities elective and humanities and social science students could enroll to meet their science requirement.

One of the intents of proposing such a course was to see if it would be possible to provide much more than a merely superficial compilation of topics in both fields. Could the theme of artbotics be used to deeply integrate elements of both disciplines? Part of what was intriguing throughout this first year of experience was the lengthy discussion carried out by the faculty in the two disciplines to try to discern ways to achieve the integration in the course content. These discussions focused on topics such as which sorts of presentations of graphic design principles or the history of graphic arts students should receive or how the arts topics would be integrated with lectures on the robotics. At times it was necessary for individual faculty to simply move ahead and offer a lecture or a lab without having gone through joint decision making. Even in these cases, the faculty reported that they found themselves thinking differently about the content of the lectures because of their exposure to the goals of the faculty from the other discipline and because they knew that the students would be exposed to the perspectives of the other discipline.

There is perhaps a lesson or two for a university in these experiences. At the start of this section, we pointed out that fruitful intercourse between disciplines is most likely to occur at those areas of overlap. *Artbotics* is one of these areas: the efforts of students are strengthened through a grounding in computer science and exposure to principles of graphic arts. The faculty that came together already had interests in shared topics; the understanding of these topics could be strengthened by bringing the disciplines together. Note that *Artbotics* was not a case, for example, of art historians trying to come together with computer science faculty or theoretical computer scientists attempting locate shared interests with artists. In *Artbotics* there was already overlap between the interests of the faculty in the two disciplines without the overlap being complete. The result for the

students and for the faculty seems to have been the unleashing of creative potential in ways that are not entirely possible when the “grammar of innovation” is drawn entirely from one discipline. For universities aiming to create these sorts of partnerships, there will be the need for careful consideration of where those creative points of disciplinary intersection are located and how they can be fostered.

Competing and Incompatible Teaching Responsibilities

Yet another challenge in academic partnerships is that the competing time commitments can differ for the various academic partners. This challenge was thrown into stark relief at UML in the *Artbotics* program. UML is a technological university where the teaching loads differ for the sciences and the humanities. The two university departments involved in *Artbotics* have very different teaching loads. In art, faculty often spend 20 or more hours with students in lecture or studio each week; the computer science faculty are expected to have six or perhaps nine contact hours per week and often have graduate teaching assistants who are able to provide some assistance for those teaching tasks. If faculty from the two disciplines are to be equally involved, more of a sacrifice will be called for by the faculty in the department with the higher teaching load. These differing teaching demands can undercut the sustainability of a partnership: in the department with the heavier teaching responsibilities it is often easier to teach within one’s department and simply cover the courses one has been assigned. Assumptions of equality misrepresent the inequalities in costs of involvement. The difficulties of bridging these differences can be enormous.

In *Artbotics*, the challenges created by teaching responsibilities was even more complicated. The development of the general elective course described above was

planned as a jointly taught course in which each of the three faculty equally responsible. But each faculty member was then faced with the prospect of teaching the course as an “overload” over and above their regularly teaching responsibilities. The academic partners had to negotiate with the individual chairs, deans, or the university provost to obtain course releases to support these fledgling efforts. Such support is crucial but such exceptions are hard to obtain and rarely last beyond initial semester or two. The question of how to sustain the interdisciplinary team teaching focus becomes very real.

Research, Teaching and Outreach: The Pursuit of Tenure

All of the faculty involved in *Artbotics* are untenured. UML is a research university with expectations that faculty will excel in research, teaching, and outreach, and the faculty are left to sort through the benefits and costs of pursuing research, teaching, and outreach through an initiative such as *Artbotics*. How do the different disciplines define what constitutes research and what are the prospects of the products (courses, articles, presentations, grants) from this project counting toward research productivity? These questions become especially important because shared projects, as we have seen above, are unlikely to draw equally on what are seen as tenurable activities in different disciplines. The *Artbotics* project in all probability does not. It is likely the case that the *Artbotics* work counts more for some of the faculty (because of their discipline) than for others. This problem of what counts for tenure will inevitably be a challenge for partnerships if it is not dealt with in some way. The urgent question remains one of what would be an appropriate institutional response to the challenge of ensuring that interdisciplinary work results in tenurable rewards for all who make innovative, disciplinarily linked contributions to the initiatives.

It should be noted that partnerships are often seen as suffering when they involve multiple goals. The multiple goals are seen as leading to diffusion. In trying to do everything, it is said that nothing gets done very well and the partnership can start to unravel. The *Artbotics* experience raises another possibility with regard to the costs and benefits of multiple goals. It may be that the multiple goals are, in fact, what can lead to success in partnership. Multiple goals—at least of certain kinds—perhaps increase the “glue” in the partnership, keeping the partners attached and involved. *Artbotics* included elements of teaching, outreach, and research and so for the faculty involved (and perhaps for their partners) the program provided a host of benefits. In other words, if the partnership was focused simply on teaching perhaps it would not work. Or, if *Artbotics* were focused just on outreach the commitment on the part of the faculty might have been limited. If the program were just focused on research it would perhaps have been difficult for the faculty to devote the time they did to a program that also strengthened the teaching provided to students. It may well be the integration of teaching, research, and outreach that makes the partnership successful. If it is the fact of multiple goals and multiple links to the roles of faculty that account for success, this, of course, raises many questions that remain to be answered. *Artbotics* may have discovered the “sweet spot,” in effect, one that allowed the partners to achieve individual aims while contributing to the collective whole. What is the best way for this integration to happen effectively? How are these multiple goals best blended? What are the best ways to integrate them and bring them together?

Conclusion: Sustaining Partnerships

As noted throughout this paper, universities are increasingly turning to partnerships across disciplines and beyond their institutional doors as ways by which university teaching, research, and service can be strengthened. Many countries—Australia, Canada, and the United States being just three examples (cf. www.aucea.net.au) are moving aggressively in this direction. The opportunity now exists to deepen the discussion of partnerships by testing out different models that could assist universities in developing effective community-university collaborations. This paper has considered, through the lens of the innovative *Artbotics* project, some of the ways in which partnerships can be pursued within a university's mission. The *Artbotics* project suggests some of the benefits as well as some of the challenges that remain to be addressed.

In this paper, as we have focused on challenges such as maintaining coherence within a partnership, we have drawn our lessons from a partnership that brings a single external entity together with multiple university partners. In some ways, this *Artbotics* project is unusual in having just a single external partner; as the emphasis in universities on partnerships goes forward, a question that remains to be considered is how many partners are optimal. This issue will be important because the large size of a university can swamp a single community partner and, more typically, multiple partners will be involved, adding depth and breadth of the partnership and bringing in greater support from the community. Multiple external partners might also be sought by a university because community partners can be fragile or in precarious financial condition and thus have difficulty taking on new projects. The involvement of multiple partners can be a way to build sustainability into a partnership; on the other hand, that same focus on

bringing in multiple partners can make it difficult for a partnership to develop a coherent program. The various partners can be aiming their efforts in different directions. Community-university partnerships may then face the task of finding ways that competing goals—not just between different disciplines but between different community partnerships—can be brought together? Questions remain to be addressed about which characteristics partners should have if they are to work effectively together and with a range of university partners.

Just as the initiation of community-university partnerships can be challenging—as we have seen in this paper—the prospects for sustaining those same relationships remain in doubt. Many community-university partnerships begin under the auspices of a grant. The external funding provides the support for the development and implementation of the new set of activities. Unfortunately, most programs cannot easily sustain all their components in the absence of external funding. The basic operating funds of the community or university partner are often insufficient to maintain a complex partnership. A question yet to be fully answered is how partnerships make the transition from grant funding to a sustained program of partnership activities that require no external support. Universities may need offices to support this transition toward self-sustaining partnerships. Such an office could, for example, help programs newly facing this transition learn from others who have successfully made this transition in the past. Or, such an office might involve itself in testing out ways in which programs can be designed from the outset so that the chances are greater that the program can be sustained, perhaps by linking activities to supported initiatives within the involved institutions.

In the end, universities focus on teaching, research, and outreach. The viability of community-university partnerships very likely depends on how well the partnership is linked to one of these central university functions. It might be possible, for example, to maintain partnership activities by locating them within teaching function such as through service learning. What was intriguing about *Artbotics*, ultimately, and makes it such an inviting example for further consideration is the ways in which the program continues to seek new ways to integrate teaching, research, and outreach.

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