# Initiating Interdisciplinary Projects: Finding Common Ground

**Gil Laware, Beverly Davis, and Karl Perusich**
**Purdue University, College of Technology, 1733 Northside Blvd.**
**South Bend, IN 46634**

## Abstract

Successful approaches to interdisciplinary projects depend on several key components. The first and foremost is to recognize commonality in purpose. In an educational setting, that is the student. As colleagues at a prominent university, we have been encouraged by the president of our university and the dean of our college to work collaboratively across our disciplines. Most of the interdisciplinary projects and scholarly activities undertaken by the authors cooperatively have involved supporting the educational mission of our institution. In fact, some of our more research-oriented projects have their roots in teaching techniques and instructional problems. And more importunately, successful and meaningful interdisciplinary collaboration cumulatively benefits students in the classroom. A second key component of interdisciplinary collaboration is to let go of rigidity of thought and process and find common ground. Lastly, a key component is institutional support. Institutional leadership should not only recognize but encourage interdisciplinary cooperation.

In this paper, the authors review the strategies and rationales they have used in interdisciplinary activities. With creativity and a disciplined focus, the authors have found common ground in collaboration and objectives across disciplines. Although not always "politically" easy, an interdisciplinary approach to teaching and scholarship has often been preferable to other alternatives, and, in some cases, necessitated by circumstances. Recommendations will be shared for new faculty so their transition toward interdisciplinary collaborations will be successful.

## Introduction

Interdisciplinary collaborations have become a way of life and are flourishing, leaving behind the isolated disciplinary silos that have characterized many academic campuses in the past [3]. Current research supports the efficacy of student active learning approaches within the context of the traditional lecture/lab classroom structure. Problem-based learning, problem-centered learning, experiential learning, cooperative team learning and service learning share common attributes that foster learning behaviors and outcomes consistent with learning objectives. Problem-based learning (PBL) stimulates engagement and learning by presenting students with complex problems. PBL can also share qualities with experiential, service and cooperative learning. Designing open-ended, directed problems for small groups of students with the intent to produce solutions that benefit real life people and institutions can be a powerful pedagogical construction.

Problem-centered learning (PCL) is more explicit and structured than PBL. These teaching strategies can encourage other learning outcomes beside developing problem-solving skills, including high student motivation, teaming skills, ability to organize, plan and execute problem-solving (technical, procedural and social), greater appreciation of course content utility, longer knowledge retention, knowledge of the real world, positive community awareness and civic responsibility, and the value of teamwork. [5,6,7]. Other positive outcomes can be achieved as well [8,9].

Student active learning outcomes that utilize PBL and PCL is a common need across disciplines. These approaches build a common ground for interdisciplinary approaches and collaborative learning experiences that is key to building skills and experiences for students to learn. The term 'interdisciplinary' is used variably as a concept, a methodology, and a process to construct knowledge in which students and instructors learn to analyze differences in disciplinary approaches to a problem and work to synthesize a new, more comprehensive view than allowed by the vision of any one field. [2]. Simply put, interdisciplinary approaches eliminate artificial fragmentation of knowledge, creating an atmosphere of connected learning and coherence in the curriculum.

As colleagues at a prominent university, we have been encouraged by the president of our university and the dean of our school to work collaboratively across our disciplines. The authors of this paper, as colleagues, enthusiastically approached interdisciplinary collaboration but immediately recognized the difficulties associated with this endeavor. For example in our case, one author is an Assistant Professor of Computer Technology, another is an Associate Professor of Organizational Leadership, and the third an Associate Professor of Electrical and Computer Engineering Technology. As we will discuss later in the paper, the first key component found in successful approaches to interdisciplinary projects is to recognize commonality in purpose. Most of the interdisciplinary projects and scholarly activities undertaken by the authors cooperatively have involved supporting the educational mission of our institution. In fact, some of our more research-oriented projects have their roots in teaching techniques and instructional problems. Although challenging, an interdisciplinary approach to teaching and scholarship has often been preferable to other alternatives, and, in some cases, necessitated by circumstances. Our success is cumulative with our experiences benefiting students in our respective classrooms. It is not our intent to add to the volume of research defending these active learning strategies. Instead, we review the lessons we've learned in the application of these strategies.

**Background**

Purdue University's College of Technology practices an applied approach to learning. This entails hands-on activities supported by a solid practitioner knowledge base. In addition, the curriculum presents a strong business orientation to the practice of all technological disciplines. The undergraduate course structure uses a traditional lecture/lab method of instruction with laboratory activities providing students the opportunity to learn the technical aspects while the lecture supports the concepts and business context. One learning objective persistent throughout the undergraduate curriculum is to develop problem-solving skills – to develop our students' skill to solve open-ended, high-risk problems that may have multiple potential solutions. Another learning objective includes the ability to work well on teams.

These practices provide the foundation and rationale for the initiation and engagement of a collaborative interdisciplinary approach as part of the educational environment. No "real world" problem is discipline specific, nor will it generally be addressed by a single individual. Any technological problem that ultimately has a technique or artifact as its solution will be interdisciplinary in character. [10] Even at the basic level of defining the problem, many people with many different backgrounds, different technical skills and different capabilities will have some input to its formulation, from management to engineering to manufacturing. Thus, it only makes sense that this interdisciplinary viewpoint percolate down to the activities of academia.

To understand our perspective, one must have some idea of the environment in which our activities are embedded. As a small, regional site of Purdue University, resources, whether they be financial, personnel or laboratory-related, are limited. Since access to resources constrains the types of projects that can be undertaken, the resource limitations of the site constrain the types of projects that can be addressed. Probably the most important constraint that limits our activities is limited laboratories. There are no large, dedicated laboratories or computing facilities at this regional location, so any activity is conditioned by this.

A second important limitation is the small number of faculty at the site. In most cases effective scholarship requires a critical mass of people to succeed if, for no other reason, the amount of work that can be involved. Currently at our location, there are ten faculty members working in five academic areas, with each discipline having one to three members each. At the West Lafayette campus, individual departments can have anywhere from fifteen-to-forty faculty. Many times within these individual departments, common interest groups develop. These informal (sometimes formal) groups of faculty that have a common interest in a particular topic or area can then form relationships that lead to scholarly activities and that provide the critical mass necessary for effectively addressing a problem in learning or discovery. Because these common interest groups form *within* the department, their activities tend to be discipline specific. One could argue that the large size of these departments leads indirectly to a discipline focus in educational and scholarly activities.

At our regional location, with only one to three faculty members per department, the critical mass to form common interest groups within a discipline is lacking. We are still required to address the "larger" issues expected of Purdue University, but without the necessary numbers of individuals to do it within any single department. This has created an environment where cross-disciplinary cultivation of ideas has emerged. All members of the faculty are located within the same facility-the same hallway, in fact. As faculty interacted, they have identified common issues that they can focus on, each bringing insight from their discipline to the problem. This has created a synergy from which a number of interdisciplinary activities in teaching and scholarship have developed. In this case, one could argue that the small number of faculty has indirectly led to an interdisciplinary focus in educational and scholarly activities.

A deeper sense of collegiality and opportunities for networking result from interdisciplinary collaboration. [3] as Deborah DeZure reported:

"Interdisciplinarity is not new. Disciplines like sociology and geography have long considered themselves interdisciplinary disciplines, and all disciplines have imported aspects of other fields

to clarify their own disciplinary perspectives. What is new is the intentionality with which these initiatives seek to promote connected learning beyond the discipline as a primary goal—pursuing knowledge that integrates and synthesizes the perspectives of several disciplines into a construction that is greater than the sum of its distinctly disciplinary parts." (p. 1) [2]

**Spectrum of Interdisciplinary Projects**

As Figure 1 demonstrates there are many elements associated with an interdisciplinary project including: (1) the student, (2) the educational nature of the project, (3) the organizational elements of the project, (4) the disciplines involved, and (5) the steps required to produce a viable outcome. Each of these elements can affect the process and outcome of the project. The foremost consideration is the student and how project outcomes will affect the students' learning, skill development, personal objectives or overall career growth from their participation in the project. This should be a key factor in assessing the impact of the project. Given the educational nature of the project undertaken, the goals and objectives should be clearly stated. Figure 1 provides a framework to ensure the plan associated with the project covers all areas for participation.

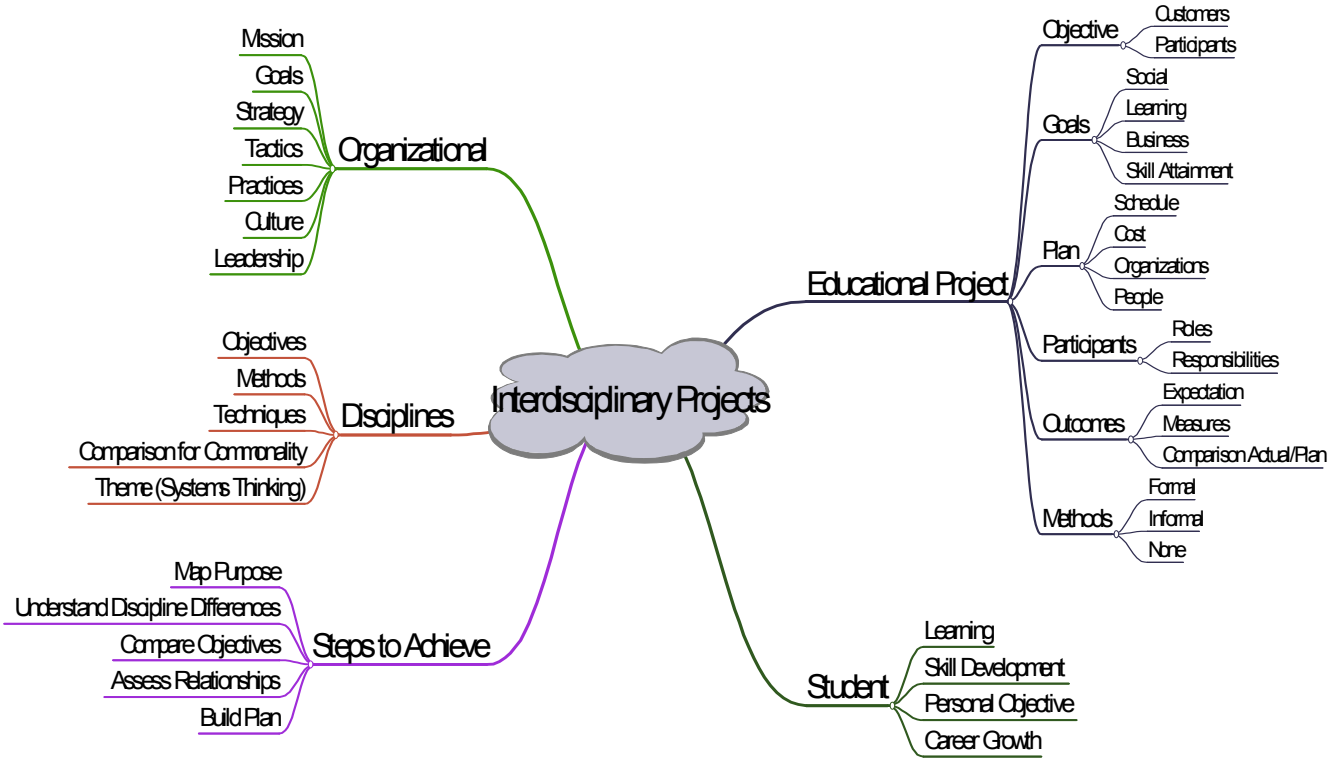


**Figure 1: Considerations in Interdisciplinary Project**

Organizational factors are very important since the interdisciplinary nature of the project requires additional coordination of time, materials, and other resources. The various elements of leadership among the participants is critical to the overall organizational success of the project.

Since there are multiple disciplines involved in the project, each brings a set of unique perspectives that have to be assessed in setting up the objectives, methods, and techniques that can be used within the project. Participants have to be willing to work harmoniously to achieve the educational objectives sought.

A detailed plan has to be set up to show the steps required to produce a viable outcome. This provides the foundation for the participants to understand why the project exists, for whom, who is doing what with whom, when the activities will occur, and how the plans activities are interrelated. These elements provide the foundation on which to focus the project.

**Focus of Interdisciplinary Projects**

As stated previously, there must be some commonality in interdisciplinary projects; in our case, this is the student. Most of the interdisciplinary projects and scholarly activities undertaken by the authors cooperatively have involved supporting the educational mission of the site. In fact, some of our more research oriented projects have their roots in teaching techniques and instructional problems. A key example is an effort in homeland security. A group formed to develop ideas for techniques and technologies that would support effective cooperation and communication between response teams in a major crisis situation. The intent was to put together a joint research proposal and submit it to an appropriate funding agency. The ideas, though, that each participant brought to the project were derived directly from business and classroom experiences. In this case, the technologies and techniques put forward in a homeland security context were the same kinds of technologies and techniques each wanted to develop for their classrooms to enhance the learning environment of the students: shared multi-disciplinary databases, organizational cultures and vocabularies, enhanced network capabilities, command and control protocols. The need and desire by the participants to understand how new technologies could enhance their abilities to communicate with their students was found to be similar to the types of technology and communications issues multi-jurisdictional teams might face in major disaster response scenario.

A second project further illustrates this link between scholarship and teaching in the development of interdisciplinary projects. The authors had all studied and used system theory as an explanatory tool in certain classes. Each author had slightly different viewpoints, from the purely theoretic approach as applied to engineering hardware to the global viewpoint advocated in effective organizations. By bringing these different systems perspectives together with the added interests in developing an understanding of how formal education is part of a career path, the authors were able to develop a concept paper that examined the implications of using a systems perspective to understand professional development. The intent was not to develop a system model with predictive properties for a professional, but to meld the various unique systems perspectives of the authors to provide insight into a professional career. Without the interdisciplinary approach afforded by the background of the authors, they would not have been able to marry their interests in scholarship and teaching on this topic.

## Recommendations

The quality of any interdisciplinary initiative is improved as a result of cooperative energies. However, members of a collaborative team must be willing to seek the common ground and let go of rigidity of thought and process. In addition, lessons learned or recommendations include:

1. *Make sure all participants have bought into the project.*

It is important to set the course of the project in the beginning, recognizing the value of each member's contribution. Each member must feel ownership for the collaborative project and there must be agreed upon rules, goals, and timelines. In addition, it is important that not only the positive outcomes be shared with students but the pitfalls of collaborative endeavors as well.

2. *Ensure the collaborative effort is aligned with institutional objectives.*

The institutional culture that welcomes this collaborative approach to research and teaching will lead to more successful project outcomes. As more researchers divide their time between interdisciplinary projects and traditional disciplinary departments, the academic research community must learn to accommodate institutionally and professionally what authors Brown and Duguid describe as "networks of practice". [1]

3. *The collaborative effort is recognized for its benefits to students, participants, and the community at large served by the institution.*

Academia typically rewards those who consistently produce publications. However, networks of practice or interdisciplinary collaborations are many time longitudinal and require associated time and effort. Recognition of these initiatives and support of the institution benefits the collaborative group and student learning outcomes. The university must recognize practice intentionality by crediting those who participate in these cooperative exchanges as these types of collaboration produce outcomes that benefit the university, the faculty groups, and the students.

## Summary

E.O. Wilson once claimed "jumping together of knowledge across disciplines to create a common groundwork of explanation is the most promising path to scientific advancement, intellectual adventure, and human awareness." [4] As colleagues who have ventured into interdisciplinary projects, we agree with this statement and have shared our own experiences and lessons learned with regard to interdisciplinary collaboration. There are many considerations with interdisciplinary projects as we have demonstrated in Figure 1. There are organizational and discipline or departmental considerations. In addition student learning outcomes must be the catalyst behind such projects. Projects must be selected by finding a commonality of purpose. Plans must be developed around the ideal that successful educational project will require finding common ground. In addition there must be intentionality built into the institutional objectives and strategies. When all considerations are addressed, the faculty, students, and the institution will all benefit from interdisciplinary collaboration.

## References


1. Brown, S.J., & Duguid (2000). *The social life of information:* Cambridge: Harvard Business School Press.
2. DeZure, D. (2004). Interdisciplinary teaching and learning. *Clemson University Office of Teaching Effectiveness and Innovation: Class Action:* v.2, Issue 3: 2000.
3. Morreale, S.P., Howery, C.B. (2003). *Interdisciplinary Collaboration: Down with silos and up with engagement.* Retrieved: www.aahe.org/interdisciplinary: American Association for Higher Education.
4. Wilson, E.O. (1998). *Consilience: The unity of science.* New York: Knopf.
5. Bridges, Edwin M. with Hallinger, Philip. (1992). Problem-Based Learning for Administrators. Eugene, OR: ERIC Clearinghouse on Educational Management.
6. Edens, Kellah M. (2000). Preparing problem solvers for the 21st century through Problem-based learning. College Teaching, 48 (2):55-60.
7. Mierson, Sheella & Parikh, Anuj A. (2000, January/February). Stories from the field: Problem-based learning from a teacher's and student's perspective. Change, 32, 20-27.
8. Cooper, J.L., Robinson P., & McKinney, M. (1993). Cooperative learning in the classroom. In D. F. Halpern (Ed.), *Change College Classrooms.* San Francisco, CA: Jossey-Bass.
9. Nilson, Linda B. (2003). Teaching at its Best (2nd ed.). Bolton, MA: Anker Publishing Company.
10. Sladovich, H.E., 1991. Engineering as a Social Enterprise. Washington, DC: National Academic Press.


## Biographic Sketches

**Gil Laware** is an Assistant Professor of Computer Technology at Purdue University. Currently, he is the Vice President of Research of the DAMA (Data Management Association) Foundation. He has written and spoken on the linkage between business planning, metadata, knowledge management in delivering information technology solutions. He holds an MBA in Management and another in Management Science.

**Beverly Davis** is an Associate Professor of Organizational Leadership at Purdue University. Currently, she is the Division Chair of the ASEE Manufacturing Division.

**Karl Perusich** is an Associate Professor of Electrical and Computer Engineering Technology. He is active in the IEEE and currently serves as vice-president for the Society for the Social Implications of Technology.