Culture Clash Unleashing Creativity in the Innovation Process: Managing Collaborative Innovation

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***Abstract*—Culture Clash comes about when trying to bring faculty and students from different disciplines together to work on interdisciplinary innovation projects. In this case study, the professors tried to combine teams from four very different disciplines into one functional unit. Each team had four students; one from a design program, one from engineering, an honors business student and an honors student in some other discipline, a "wildcard." In each case, the students come from a college with its own strong culture.**

***Index Terms*—Collaborative innovation, corporate clients and mentors, interdisciplinary student teams, and multi-disciplinary faculty.**

I. Introduction

Silos develop Cultures within their boundaries (Universities, Colleges, and Departments)

This is a study of an interdisciplinary, intercollege, interuniversity, innovation project with a corporate client. Faculty donated time and creatively sought students and a very helpful client to create this experiment in an environment for innovation.

Consider the silos in this project: Design, Engineering, and Honors. These are not based on a literature search, but on experience. First, the faculty involved talking about their own school cultures in the planning meetings. Second, we have visited each other's colleges and shared past work experiences in innovation and entrepreneurship.

In design, the students tend to be artistic and enjoy the freedom of the arts to explore and test. When you walk in to the design college, you can see the differences all over the building and in the people, as well. The building is full of special spaces to enhance creativity on every floor. In design, there is much more discussion than absolutes. They tend to be synthetic thinkers which is a contrast to the analytic thinkers normally found in engineering, business and in the sciences. In the design college, there is a real focus on exploration and concept development, to enhance design and user interface. The walls and hallways are filled with posters of exploration and models of concepts. The lower floors contain maker labs to help with laser cutting and 3-D printing. These are filled with artsy students, physical models, parts, or art. A student can run to the shop and grab some materials and make a prototype. The program emphasizes design and user figure interface. The students work with unusual libraries, materials and things like furniture. In short, they are synthetic thinkers in a creative environment.

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Engineering is quite different than design, these students are career-focused and anxious to secure stable, high-paying jobs. In the university, engineering majors are co-op programs so these majors and concentrations tend to attract students that want to end up with a job upon graduation. They trade off their summer vacations in years 2, 3, and 4, for a year-around calendar and great co-op experiences. These young people are focused on getting what is needed done. They want to do a good job efficiently. They are like many engineers, "tell me what you need and go away and I will make it." There is little thought that the customer might know better about what they want or need. Engineering students give even less attention to the idea that customers might know how to make it better! Engineers also have a focus on function, which is expected and desired from engineers, but very different from the focus on design and user interface.

The honors college at the university has developed its own student culture. Students have the option to live with one another in one of the honor's dorms. Envision dorms full of highly-competitive over-achievers desiring to excel at whatever they do. Grades, awards, fellowships, internships, research grants, and special opportunities are the immediate currency of success. The students have sufficient scholarships in most cases so money is not a driving force in their academic pursuits. Students are willing to change directions on a project to excel even if it means working all night for several nights to get it done to perfection. They also look for projects that fit with their personal goals and objectives. As they look at projects they want to know what they get for their time spent. Finally, those honors students from the liberal arts will find themselves working in all parts of a project including definition, concept development and a final presentation. They expect excellence from their teammates.

The faculty of the honors college has cultivated a cross-disciplinary [1] and interdisciplinary culture that may not be understood by engineering or design students. How does a design student feel when the biologist on the team turns up with a design based on what the customer segment has been describing? How do the engineers feel when a chemist works with a friend in physics to out how to make some part to move forward? The interdisciplinary world knows no bounds unlike most of the silos of the universities today. The faculty keep thinking that students from this discipline will do this, and the other discipline will do something else. However, when you include interdisciplinary thinkers, the faculty may be surprised by what each person does.

Where do the business student from honors fit in? As honors students, they will know how to be serious, interdisciplinary thinkers. As business students, they will be

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interested in the innovation process from start to finish, tracking the business case all the way through the business canvass. In addition to being serious and interdisciplinary, the business student is likely to be interested in the whole process and constantly focusing on how this is going to make money –the currency of success of business. What are the challenges of teams composed of these four groups, (designers, engineers, honors business, honors other disciplines), of students together?

What is the novelty in this project? It is several things that are combined:

- Engineering students working with business is not ne [2].
- Design working with Engineering is not new [3].
- Both together with the addition of a Wild Card or an honors student from another discipline like liberal studies, biology etc. is different and potentially new.
- Classes working with business clients is not new. There are many rich experiences cited in the literature [4].
- Adding all the disciplines and working with a client is new.

Perhaps the most novel is the fact that this project coordinates students and faculty from two universities and six colleges working together with a corporate climate using essentially a design thinking process for innovation.

II. Combining Education Silos Creates Problems

What did the students get? The first problem in terms of culture clash is that the students were put on teams but were receiving very unequal credits. The engineers received only one credit and the thanks of their professor. The design students got credit for a three-credit class through their department head who is on the team of faculty creating this initiative. Honors students had at least three choices:

- Senior Projects which they can take for 1 to 3 credits.
- Junior Seminars on an independent study basis – usually three credits.
- Participation without credit.

Honors students' choices depended on their need for credits. Most honors students do not need credits as they enter the university with so many credits through AP, CLEP, and early college courses, etc. Each honors student desiring credit had to submit a plan and find an agreeable mentor, the faculty member from business and honors.

In addition to the number of credit hours differing, the types of credits varied. This was another difference that could have a lot of impact. The engineers have a two-semester capstone sequence where they develop an idea in the first semester and build it in the second semester when all the other students have gone on to other things (design, honors business and honors interdisciplinary). The design students were using this as their capstone class. Since honors students take capstones in their major areas they do not need a capstone and instead work on an agreed upon senior project with a faculty mentor. This makes the types of credits that people are getting very different. Engineers and Design students need this to work to graduate. Honors students, could simply change, and submit different senior project or junior seminar if things got to rough, or may not have any credit at all. These differences could have made it hard to hold teams together unless everyone is trying hard.

Age makes a difference. Senior design students are likely to be 22-24 years old, per the best estimate of their professor. Sometimes they have started at another college and then found design and then come to the design college. It is also possible that their artistic side, the need for money, or a great internship has detained them along the way. The senior engineering students tend to be a typical college cohort of 21-23. Many of them are on a five-year schedule due to the intensity of the co-op program, not having the right tools on entry, or scheduling issues such as trying to include a special program, an opportunity at their co-op company, international experience, etc. The Honors College students tend to be younger as they often enter with a full year of credit so they can be doing senior projects at 19 and 20. They may well be the younger, more serious student. Due to a drinking age of twenty-one, these age differences might have created problems in terms of group cohesiveness and out of work socializing. This is a beer town with many craft breweries and neighborhood bars for socializing. By contrast, within the community there is a focus on MIP's (minors in possession). It is currently a big issue in enforcement and it could also split the teams who after working for hours together, might normally walk to a pub or bar.

Another area of difference is in the personalities and approaches to life that they have. There was an attempt to alleviate this by having the students take a VALS, Meyers Briggs or DISC before starting to think about team formation. More importantly, the professors spent a little time talking about it and had some discussions on how they might best work together in the formation of teams for the initiative.

Location was another issue of difference. The students work on three different campuses. Seven times in the winter semester, meetings were held at a corporate location about 30 miles away. Because they are in co-ops, many of the engineers have cars but they are located on the urban campus. The younger honors students tend to live on the rural campus about 20 miles away and usually do not have cars.

Fortunately, there was a dedicated space in the design college for regular meetings for class with instructors, for critiques and reviews of the projects and for meetings as needed by the student teams. This space was very accessible to the design students on the first floor of their building. It was several blocks for the engineering students. The honors students had a twenty-five-minute bus ride plus a several blocks walk, unless they happen to have a class at one of the university's urban locations. Most of the honors students came from a different distant campus. It was interesting to see how this worked in terms of meeting space given the difference in time and energy cost. Would the students meet in the physical space in virtual space, or not as much as the professors hoped?

Scheduling was still another issue as students have busy schedules at the two large universities represented. Many go to school full-time and work full-or part-time to help with their cost. This initiative required more meeting time than a normal class and almost all the work is group work. Did they all share a similar commitment?

Faculty share this problem with two of them having students they see all the time. The honors students have not been and will not be a class. They would sign up for this initiative as a senior project, junior seminar or as a participant. The honors faculty would have presumably twelve different projects from students he may or may not know. Again, the setup was very different for each group: engineers, designers, and the honors students. The honors students represented the business students, and the "wildcards," or diverse majors.

What would all these differences lead to in terms of how the students perceived the class, their group and so forth? Would any group stand apart? What would the faculty do to build the teams of designers, engineers, and students into cohesive teams? There is a great potential for dissonance as well as great opportunity for creative team-building.

III. Instruction

There are issues in the roles of the professors that also could lead to culture clash. First, who is instructing on what topic is important. All three professors have taught and led innovation programs including I Corp like programs, boot camps, Start-Up Weekends, as well as traditional classes. What makes a difference is who leads what section, who provides the assignment for what section, and who grades.

In previous team faculty efforts, it has become abundantly clear that it does help to let the students know that the assignment will be handled by Professor X and the second assignment will be graded by Professor Y as they know the professors have different styles and disciplinary approaches. This is essentially a Multi-disciplinary approach as defined by Stember, "people from different disciplines working together, each drawing on their disciplinary knowledge" [1]. The student networks help them prepare for a known style of culture and grading. However, even with that, a marketing professor may teach and grade a customer needs analysis differently from a design professor. In academia, the sanctity of the grader's domain is very important.

Would everyone be graded by their respective professor from the beginning to the end of the semester? This is a very practical solution but it does not encourage team work. In fact, it encourages each member of a team to stand alone. The opposite would be to have the whole team graded together on each assignment. This would hopefully cause the team to work together more but might cause the teams to react in different ways with each change in professor grading the teams. Finally, how do you calculate that final grade? It is expected that the honors college students will be the most grade conscious so how do you make this work? What happens if final grades for team members as entered into a grading systems are substantially different?

In the university, the honors students are legendary for their focus on grades to several decimal points. This may be partially explained because this is how they got to be where they are and is built into the individuals. It is also encouraged by two major things; first many of their scholarships require that they maintain high grade point average, some as high as a 3.75. This makes them look at every assignment for a 4.0. Second, many of them are applying to competitive graduate schools and fellowships and need high grade points to qualify. Grades will determine their future. Both engineering students and design students need and want good grades but their cultures are determined differently. The engineers often are hired by their coop employers, after three long hitches the company knows the student and has invested a lot in their development. Design students will be judged on their grades, portfolios and internship experiences. So, students are likely to approach grades very differently.

Clear rubrics might be a way to handle this. Conceptually, the idea is excellent for many assignments and they are used extensively in the honors college and other courses. However, using rubrics with details to guide a process may limit the space for the creative innovation that is sought. If they are to be used, the sharing faculty need to construct them together so hopefully rubrics would be applied in a similar fashion by the three faculty. Even further, it would be ideal if rubrics were being used to include the corporate mentor team. Practically, creating rubrics get more and more difficult the more people who are involved and the more creative the exercise.

How do you coach and mentor a team that has two other colleagues who are evaluating the team's performance? What happens to a team if another professor coaches them away from the direction that you thought they should go? Remember all the design students were in the same building with their professor, all the engineering students saw their professor given the size and configuration of the infrastructure. On the other hand, the honors student might only see their professor in class meetings and online.

The faculty members, needed to give some thought to how learning was to occur. One could make the multidisciplinary [1] assumption that each student from a discipline should contribute from their discipline. Another assumption that could be made is that here is an opportunity for the design student to learn from the engineer, the business student, and a third discipline. This would require that the engineers share the house of quality, the business students share the business canvass, and the design student shares design thinking or something like that. Everything is possible but the faculty must decide with intent. Faculty must learn how to encourage the intense collaboration that is part of generation Z [5].

IV. Pros and Cons of Using a Corporate Client

There are many pros and cons to use a real client in such a project.

1. Pros

- Provides a focal point for the entire class of faculty members and students
- Helps the students see application in the real world
- Demonstrates a transdisciplinary approach [1]
- Experience managing work in a broader range of ages [5]
- Desire to please client and this takes away from grade focus
- Learn from constant client team feedback estimated at eleven occurrences
- Obtain access to surrogate customers or channel members through client
- Iterate instead of turning back or quitting

- Create abrasion [9]
- Critiquing from the client team
- Gets at speed of innovation
- Builds student's resumes as they have worked on a project for an international corporation
- Funding for basic models or prototypes will often be provided by client

2. Cons

- It adds one more culture
- It adds one more set of evaluations which may or may not line up with academics
- Organizations are fickle and can change at the last moment
- People are moving in and out of organizations all the time
- Student travel arrangements to and from corporate meetings and additional time
- Corporate schedules are often not student schedules

V. Is This a Mix of Ways of Thinking?

- Designers would tend to be right-brained and synthetic thinkers
- Engineers would tend to be left-brained and analytic thinkers
- Business students would tend to be left brained and analytic thinkers
- The sciences are typically analytical and left brained
- Social Sciences?

VI. Is Culture Clash a Threat or an Opportunity?

Reading about all the differences above is a reminder that the different cultures were a threat to this whole class. Why would three otherwise slightly eccentric professors walk in to this inferno of inconsistencies, of different goals, of different styles, etc. that is true interdisciplinary learning? Why not quietly teach a more traditional class that students have grown to expect and get excitement out of heli-skiing, surfing, going on missions to countries rampant with infectious diseases, or climb live volcanoes etc. Spending time with students who are dissatisfied because they are expected to think and to do some real work to come up with an answer can be a challenge. It may even be a battle.

Or, was the opportunity here too great to be missed? Was this a chance to be interdisciplinary in a way that students and faculty usually do not get to experience? Did this give students something close to a real-world setting to try their interdisciplinary abilities together to solve a problem? Was this a chance for faculty to learn from each other, interdisciplinary students, and a transdisciplinary corporate team as well? Was this an opportunity to work on problems without knowing what the answers should be? Was this a chance to learn as much or more than our students as together across universities and departments the faculty teams seek to resolve these challenges one-by-one?

Would this unleash the creativity of all the parties? Would all the clashing cultures provide the challenge to look for creative problem solving? Would interdisciplinary teams find different solutions than single discipline teams? Would everyone learn how to look at a problem in multiple ways?

Was this a chance for the faculty to be entrepreneurial and take the time and effort-risk to see if they have together a way of sharing in teaching innovation that is more powerful than any one of them alone? Was this their chance to invigorate their teaching in other classes with insights gained from trying to work in an interdisciplinary, multi university, applied professional project? Was the potential here as big as it seemed?

VII. What Was Learned in the Clash of Cultures?

There are three major sources here labeled according as each is used: Authors Comments, Student Focus Group, and VALS. Authors comments are based on his personal observations and experience of the project. The Student Focus Group was conducted at the very last class meeting of the semester by a person who was familiar with the class, and the corporation but was not faculty or a current corporate employee. The faculty were out of the room in another location during the discussions. The notes were taken by the student administrator of the project. The moderator had done this professionally for many years. VALS is a trademark for a psychographic or life style test owned by Strategic Business Insights.

- **Construction of teams**

Authors Comments:

The construction of the teams was only modified a little. As discussed above, each team consisted of:

A design student from the design college (part of a separate university). These students were part of a class.

An engineering student who was part of an engineering class

An honors business student who is part of the honors college and taking a major in the business college. They were not part of a class but using this for an honors independent senior thesis.

An honors student not from the business college majoring in some other area, for example, Liberal Studies, Biology, Psychology and so forth.

Two or more team members were volunteers in the sense that they were not getting any credit. One was a recent graduate who had been a student of the author. A second, also a student of the author, had accumulated more credits than he needed and wanted the experience.

- **How did students feel about different levels of credit?**

From Student Focus Group as recorded:

Expectation going in was pitched differently by professors, some people took it for credit and others didn't. Different levels of people applying themselves and less motivation by some (students). Should have gotten a project brief and/or scouting and screening the program members.

Individuals, who got fewer credits for the class, felt the pressure by the work load and time needed.

- **Common spirit of innovation across the majors see VALS are these the risk takers?**

Students voluntarily took the VALS Survey as part of their

first assignment. Of the eleven who voluntarily reported their results, all were either Innovators or Experiencers. See Table I.

TABLE I: VOLUNTARY REPORTING OF VALS RESULTS

VALS Primary Lifestyle	VALS Secondary Lifestyle
Achieving	Experiencing
Experiencer	Innovator
Experiencer	Innovator
Experiencer	Innovator
Experiencer	Innovator
Experiencer	Innovator
Innovator	Experiencer
Innovator	Experiencer
Innovator	Experiencer
Innovator	Experiencer
Maker	Experiencer

This seems like an amazing concentration of power for those representing about half of the team members 11/26. It also helped to have this community of risk-takers and doers.

- **Positive experience of working with the outside corporation that was excellent**

From the student focus group as recorded:

Most important thing: the feedback from the corporate partner (learned something every time they talked) and the involvement was getting to work with all the different disciplines, learned how to communicate information effectively between the different disciplines.

Nice having the experts in their field, but there was conflicting feedback.

The corporate partner could have potentially given more specific information on topic.

Seemed like a lot of guessing, didn't know what normal answer for the questions were. Typical Product Life Cycle was different then what theirs looked like.

- **Positive experience of meeting at one of the campuses**

From Student Focus Group as recorded:

Liked to see everything up in the room, but other (design college) students could see what was put up.

A lot of people put things up and didn't utilize it ever again

Liked that there was a workplace always there to utilize and it was almost personalized by team to feel like it was their area. Also, people liked being able to see the progress of ideas.

- **Positive experience working across the disciplines in most courses**

From Student Focus Group as recorded:

It was cool to see how the three disciplines work together, gives a real-world perspective while in a college setting. One of the most important part of the project.

Could have used another design student. Business and engineering side a little lacking.

Business side was more marketing-centric and other business students had a hard time with marketing topics they weren't well versed in.

Really nice to see the other side of product development, didn't need to see the nitty gritty of it all.

Second designer might be needed on the teams; a lot of work was placed on one individual.

In the team with an extra business person it was very beneficial to be able to bounce ideas off of and work with to lower burden.

The wildcard was also beneficial to offer a unique perspective. (Wildcard referred to students not from business engineering or design).

- **Students work across the silos easier than faculty**

Authors observation:

These faculty members had all worked together in various combinations before in Innovation and in other areas. They may have known each other's strengths so well that they did not generate the enthusiasm for working across the disciplines that the students displayed. It may also be that the professors were more multidisciplinary and the students more interdisciplinary.

- **Positive when all together faculty worked well coaching together**

From Student Focus Group as recorded:

Profs worked well together.

Enjoyed working with my professor, on project, didn't work with other prof too much because people focused on their corresponding professor.

- **Challenge of faculty working with students differently**

From Student Focus Group as recorded:

Expectation going in was pitched differently by professors, some people took it for credit and others didn't. Different levels of people applying themselves and less motivation by some. Should have gotten a project brief and/or scouting and screening the program members.

Structure was very day-to-day, week-to-week. Started slow in the beginning and very quickly in the end. Too extensive in the back end and too much time in the beginning.

Would have liked to learn more from the professors with lectures, a lot of time on design. Profs should have spent more time lecturing. Some disagree with this.

Two nights a week with prof instead of one would be helpful. Deadlines made it difficult to really dive into topics. Prototype time restraints made it difficult to make a working one to put into the use-case scenarios.

- **Challenge of students having different style**

Authors comment.

The problems were not the ones expected. Going into this it looked like the basic approaches to the disciplines might be the problem. It turned out to be more the basic approach to problem solving, classes, and expectations of the students. In the case of the Honors students both business and those from other disciplines beyond engineering and design (wildcards), they are driven. Their approach to things is to figure out a process and work the process. They have been doing this since the early school years and that is how they became honors students. Procrastination is not their style. They want to know what they need to get done and then make it happen. They are looking for a direct route and are very motivated.

The design students seemed as creatives to be much more last minute in their approach to developing ideas. They are artistic in temperament and just seemed to be waiting for a direction. The engineers of course wanted to get to the point that there was something to make. In the one group that had a strong engineer leader they were always making something new and trying it. These differences were significant and

important and should be worked on if this project were attempted again.

- **Challenge of intensive use of faculty at a time when all universities are stressed**

Authors comment.

This is an interesting challenge. Here was a program that was very applied and in which students learned a great deal. The problem was that it absorbed the attention of three faculty members from two institutions for approximately five hours per week plus additional time with teams. In the larger business school, the load is normally 40 students per class; in the honors college, more like 25; in the engineering college, the size of classes seems to decrease as you move up the courses starting large and ending smaller in the teens; in the Design College, 10 to 15. However, in this project the ratio was 8-9 students to one faculty member. The project started with a few more student volunteers some of whom removed themselves. The colleges and universities would have to figure out how to pay for the cost to make the project sustainable or the professors would have to figure out how to make the project more scalable.

- **Faculty were grading from different standards**

Authors comments.

In the short run, this was probably not a problem. If this was not a special project but a regular class, the fact that all three faculty members graded differently would be significant. There were no fixed rubrics that students could review. The Honors students in business and in other disciplines were graded on three outputs which were based on their experience of the program, their team project, and an overall plan of the project as they perceived it.

The engineering students were graded mainly on their senior project work, which was after the part of the project reported on here. These six students continued to prototype one or more of the projects. Their interest in this project was to get a good design that would lead to a good prototype.

The design students seemed to be used to a more individualized grading system which works well in a college with smaller classes.

VIII. Conclusion: A Positive Experience in Managing Collaborative Innovation

The project was an incredible innovation experience. The project was full of great energy. The energy came from the Corporate mentor teams that gave time to the students repeatedly. Energy also emanated from the mixed student teams that had to learn from each other as well as from the corporate mentors and faulty. There was also energy in the room as faculty members were learning from corporate mentors and from each other. It was an in-depth experience in the process of innovation. Students struggled with the demands of high-functioning corporate professionals; this is one way of learning. Mixing the students from two universities, six colleges and several disciplines turned out to be a very positive experience for all. The students surprisingly even suggested more time and not less in the face to face part of the class if were offered again.

Faculty members learned from each other, and from each other's students with their different approaches. A lot of thought was given as to what was the right mix of marketing, engineering, design, ethnography etc. In terms of Stember's taxonomy [1]:

Transdisciplinary thinking seemed to be led by the corporate mentor team.

Interdisciplinary thinking seemed to come from the participants.

Multidisciplinary thinking seemed to come from the three faculty members.

Thanks to the hosting university the room proved to be an excellent addition to the class. In the sterile classrooms of many universities with technology in front and art on the walls, there is no place to keep visual photo and sketches of the innovation journey. The room was a good social space where people could come together safely. It was like a family room for the innovation teams. Each team had a space for photos, sketches, notes and ideas, as well as for a little humor. This is often missing in the sterile classrooms of today's universities. The space had lots of maker materials available and teams were only steps away from the maker labs of the design college. This helped to encourage hands-on innovation.

Every student appeared to have learned to share across the disciplines, and mentors' minds worked in approaching innovation. They have participated in a very applied innovation exercise and have the academic theory as well as the professitable

onal perspective. They have their output of a project and the logic of how they got there. They have used Design Thinking, and they have seen the very similar but modified version that one corporation uses. The have made presentations to professionals. They have sat with faculty and professional teams for critiques of their work, and iterated in directions. They have exploded on to the scene of people who understand a process for innovation in a product/service. Following these young people will be one of the greatest pleasures of the next few years.

So, what, why is this important? It is a challenge to the way academics conceive of education in our academic silos. How many deans are ready to let go of their fiefdoms and share their major students with other colleges or even across universities? How many university presidents are ready to reserve a classroom for a multiversity project? How many faculty members are willing to enter a multi-faculty program with students from six colleges and two universities? Are you ready to give up your evenings to be with students who want to learn?

This program is one small example of new innovative directions that education could take in the future. It is significant because the faculty, the students, the corporation, and most important the mentors who volunteered their time to make the innovation experience so powerful. If there was funding for faculty release time could this type of program be improved and become more efficient without losing the benefits, or are the benefits to the students so great that it is worth the investment in time, money, energy, and space by corporations and universities.

Should this be considered faculty development as well as student development as they learn from the corporate mentors. Should this be considered truly interdisciplinary as each team

as a minimum of four very different majors? Is this what an innovation capstone should be in a university in the 21st century? A true preparation for life in the next stage?

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