

Kevin Bierre
FLC 2005-2006
Project Report

This document reports on the project that I did as a member of the 2005-2006 Faculty Learning Community. I will provide the original proposal, cover the implementation, and review the results. Future directions will also be discussed.

Proposal:

This is a copy of my original proposal:

Faculty Learning Community
Project Proposal Form

Name:	Kevin Bierre
Course(s):	Programming for Information Technology III
Project Name:	Promoting Teamwork in an Introductory Programming Course
Date:	January 26, 2006

Problem:

Most of the programming work that students will do in industry will be as part of a team. Unfortunately, we do not teach teamwork as a part of our programming courses in the IT department. In the last course of our programming sequence, we do a team based final project. There are often problems with the teams in terms of equitable division of work, getting work done on time, and getting good quality work from some team members.

I feel that there are a couple of reasons for the problems seem:

1. The maturity level of some of the students is not sufficient to ensure that they work well together and complete their work. Unfortunately, this part of the problem is not something I feel I can address.
2. The students have no training in working as part of a team. As a result, they do not understand what is required of them when they are placed on a team. This part of the problem is solvable by providing the necessary training and experience as part of the programming sequence.

Goal:

Provide students with training and team based activities that will allow them to learn how to work as a team. The end result should be set of teams for the final project that will be able to successfully carry out the required work without the team difficulties seen in prior quarters.

Target Students:

Third quarter freshmen in the third programming course of the IT programming sequence.

Hypothesis/Proposed Solution:

The primary reason for the team work issues that come up on the final project every quarter is a lack of experience working in teams. To address this issue, I propose making the following changes to the way the third programming course is run in IT for one of the two sections:

1. The students will receive a lecture on how to organize and coordinate a team. This is not currently done in the course.
2. The lecture on project planning will be moved up to the start of the course.
3. All in class exercises will be rewritten to use teams of two programmers.
4. All homework assignments will be rewritten to use teams of two to four programmers. Specific team deliverables such as design documentation will be a major part of all homework assignments.
5. The final project will use teams of four programmers, with required design documents and a peer review of team member's contributions.
6. Teams will be assigned by the instructor.

Since I have two sections, I plan to only apply the team based approach to one section. In the other, the usual course schedule will be followed.

Progress Point:

Not certain what should go here.

Successes:

Expect to see:

1. Detailed design documents for homeworks and the final project. These documents will show that students can break down a project into tasks and assign the work in an equitable manner.
2. Peer reviews should indicate that teams are splitting up work and all doing assigned work.
3. End result should be a well tested piece of software.
4. Attitudes should be positive toward the use of programming teams.

Obstacles:

Possible obstacles include:

1. Student refusal to work as part of a team – have seen this a couple of times.
2. Technical issues with MUPPETS environment

Surprises:

I don't expect any oddities, but you can never tell. (My last final project in 219 had several unexpected events.)

Comparative Results:

With two sections, I should be able to compare student attitudes about the team experience. This will be done through the use of a questionnaire done at the end of the course. In addition, the team peer reviews will be examined for both sections.

Assessment:

Peer reviews are part of the final project already. These will also be added to the homework assignments.

A survey will be developed to evaluate student attitudes towards teamwork after they have completed the final project.

Future Study:

Running this type of a study on an upper level course like "Application Programming" or "Distributed Application Programming" could be interesting. By the point students take these courses, the maturity issue has mostly disappeared. In addition, many have already had their first co-op experience and have seen team use in the industry.

Resources – Faculty/Student Advisors:

Keith Whittington – former FLC member, will advise on active learning activities
Andy Phelps – MUPPETS coordinator

Resources – People:

Mike Yacci (?) for guidance in developing a survey to measure student attitudes about teamwork.

MUPPETS development team – specific technical questions for final project

Resources – Conferences:

- Lilly Conference
- SIGCSE
- SIGITE
- Frontiers in Education

Resources – Readings:

1. Harold H. Smith, Debra L. Smarkusky [Assessment of IT competencies: Competency matrices for peer assessment of individuals in team projects](#) October 2005 **Proceedings of the 6th conference on Information technology education SIGITE '05**
2. Nachiappan Nagappan, Laurie Williams, Miriam Ferzli, Eric Wiebe, Kai Yang, Carol Miller, Suzanne Balik [Improving the CS1 experience with pair programming](#) January 2003 **ACM SIGCSE Bulletin , Proceedings of the 34th SIGCSE technical symposium on Computer science education SIGCSE '03**, Volume 35 Issue 1
3. Debra L. Smarkusky, Harold H. Smith [Team projects throughout the curriculum: course management, teaching initiatives and outreach](#) May 2004 **Journal of Computing Sciences in Colleges**, Volume 19 Issue 5
4. Dawn McKinney, Leo F. Denton [Affective assessment of team skills in agile CS1 labs: the good, the bad, and the ugly](#) February 2005 **ACM SIGCSE Bulletin , Proceedings of the 36th SIGCSE technical symposium on Computer science education SIGCSE '05**, Volume 37 Issue 1
5. Davor Čubranić, Margaret Anne D. Storey [Collaborative learning: Collaboration support for novice team programming](#) November 2005 **Proceedings of the 2005 international ACM SIGGROUP conference on Supporting group work GROUP '05**

Implementation:

I had two sections of students. The morning section (22 students) received the standard course treatment. This meant the following:

- All in class exercises and homework assignments were individual efforts.
- The teamwork discussion occurred in week 6, as is usually done in this course.
- The project planning discussion occurred in week 7, as usual.

The afternoon section (33 students) received a revised treatment:

- All in class exercises were done in pairs.
- The teamwork lecture occurred in week 1.
- The project planning lecture occurred in week 3.
- Homework 1 was an individual effort, but all other homework assignments were team projects.

Both sections received the same team based final project. The order of lectures in both sections were the same.

Teams for all work were self selected.

Students were asked to complete a survey about teamwork issues during week 1. A similar survey was given during week 10. 25 out of the 55 students completed the surveys.

Results:

Survey results indicated some similarities between the two classes:

- Most had positive team experiences in the past.
- They felt teams were suitable for programming courses.
- Most felt non-productive team members should be removed.
- Teams worked better if members had a wide range of experiences.

There were also some interesting differences between the sections:

Question	Section01	Section02
Instructor assigns teams?	Disagree (originally undecided)	Undecided
Comfortable with amount of teamwork?	Undecided	Agree
Lectures on team skills helpful?	Undecided	Agree

I did not see the level of interpersonal issues with the afternoon section that I had seen in the past and had seen in the morning section. Common issues that had come up in the past were:

- Work division
- Work quality

One issue that did still surface in both sections was time management. The students often had problems coordinating schedules to work together. A variety of solutions came out, such as:

- Sharing code on a server – both saw the changes the other had made.
- Having one copy of the code and passing it back and forth by email.
- Late night sessions in the open lab when both partners could attend.

A couple of odd occurrences did come up during the project. The first was a technical issue. We used a collaborative virtual environment called M.U.P.P.E.T.S. This environment requires a graphics card and a fairly fast computer. In the past we had problems with older graphics cards. This time we had issues with some of the newer cards on the market. This issue will be addressed over the summer, but was unexpected by all of us.

The second was a programming error that cropped up late in project. While I corrected it quickly, it affected some of the students at the last minute and was a source of some frustration.

Future Directions:

Overall, I was pleased with the way this project went. It confirmed my suspicion that a lack of team experience was behind many of the problems seen in the past.

I think the following items could be done to expand this study:

- A larger sample is needed for conclusive results. Some changes that could be made include:
 - Expanding the number of sections involved.
 - Making the survey an in class written survey rather than allowing it to occur via Clipboard.
 - Collecting data over multiple quarters.
- Working with instructor assigned teams rather than self selected teams. This would expose the students to a variety of different team members.
- Doing assessments more frequently through out the study, rather than relying on just two surveys.
- The students were not comfortable dealing with peer reviews. Either they gave each other the same reviews or they just did not do them. I made them a part of the homework grade, but really did not get a good response. Other ways of evaluating the team effort should be investigated.