Collaboration through Agile Software Development Practices: Student Interviews and Lab Observations

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I. Introduction

The first semester of a 3-year longitudinal study in advanced undergraduate software engineering class, CSC326, has been completed. A group of researchers at NC State University are examining and analyzing student success and retention in the educational setting when classes utilize the agile software development practice of paired programming. Two sources of data provide evidence of what was learned from student interviews and laboratory observations. This report documents research efforts, funded by a National Science Foundation grant (EIA-0305917)

During the semester, four different labs, Lab A, Lab B, Lab C, and Lab D, were videotaped and transferred to CD for evaluation and analysis purposes. Later in the semester, while students worked on their team projects, labs were no longer video taped, but were observed and field notes were taken for analysis purposes. Of the more than 100 students in the CSC 326 class, seven students volunteered to be interviewed in the month of October: S_1, S_2, S_3, S_4, S_5, S_6, S_7. Students S_1, S_2, S_3 were female. These interviews were audio taped and then transcribed for evaluation and analysis purposes. In the interviews, students were questioned concerning their experiences with two paired programming assignments and one solo programming assignment. The interviews were semi-structured, probing to reveal emergent themes. A protocol of the major elements of the interviews and transcripts are included in Appendix A.

II. Emergent Themes: CSC326 Student Interviews

Data from student interviews revealed nine dominant themes: Higher Levels of Responsibility, Less Time, More Time, Ability Level Factors, Difficulty of Assignment,

Dysfunctional Pair/Inappropriate Initiative, Management of Assignment, Increased Learning, and Dependency on Partner. Each of these themes is described and data are provided as evidence to support the theme. The voices of the students provided thoughtful insights concerning their experiences in paired and solo programming.

1. Higher Levels of Responsibility

The interviews revealed that the paired programming assignments created a context where the students perceived more responsibility to other students in their pairs. Students expressed concern that their work could affect another's grade or perhaps that partners would be angry or disappointed with their contributions if work was incomplete. In response to these concerns, students voiced their opinions about paired programming experiences.

S_1: … because you kinda got the responsibility of the other person…

I: So what you're saying is working in pairs makes you more responsible?

S_1: Exactly, …, It's kinda more formal as in you make arrangement (for) meeting times, whereas if you're working on it on your own you, you don't organize… It can definitely be a better thing to have, you know, set times that you have to meet someone. And you feel like if you don't turn up, you know, they're going to be upset or whatever, and its going to be, its going to reflect on their grade as well as your own. So, you know, you have to think of someone else.

S_2: … but the effect of two persons doing it together is that, you know, you say "I'm meeting my partner tonight at 7, I have to get this bit done" or, you know, "I have to read up this stuff before I meet her". So, uh, when we meet we'll do stuff like, you know, um, we'll really talk about the issues we have or, you know, really be productive, you know, as opposed to, you know, just sitting there and, um, you don't want wasting … of the other person's time that's, that's a very important thing you don't want (to) drag … the other person, you know, like they might have something else to do.

I: So you feel more responsible to the other person?

S_2: Yes. Yes, exactly. You be thinking of, you know, be responsible for the thing … But if you're doing you're solo then you're like "Yeah I can do it one hour later. I can, you know, have an ice cream right now". How you interact with people at work especially like, you know, if you're doing some stuff on your own you can do whatever way you want, but in a pair programming situation you really have to respect the other person and always be thinking about the other person, how they think, and always constantly consulting with each other and that's a totally different working style. A sort of like an approach…so not communicating is definitely not good, while you wouldn't get any work done for pair programming if the two of you (were) not meeting up often enough… From my experience…if you really want to get full benefit from pair programming, you really have to get together two of, two persons sit beside each other doing stuff together as opposed to you know just meet up one time and decide, you know, break it up, I do this part, you do that part, and then we meet again tomorrow or the day after…I feel that approach wouldn't be, um, as effective as say, spending most of the time sitting together doing it.

I: What about the pair programming? Do you think makes it an effective instructional tool?

S_3: Um, I think that it holds people more accountable. It makes people not do as much work at the very last minute, um, since they have to schedule with their partner and they just are better about planning it and working on it and I think overall they, um, take more time to do it right.

S_7: I think overall (success) depends on how much the person is willing to do whatever's necessary to, you know, for the sake of the group. I think that's what it boils down to… Even to a certain extent I think it's an, a, a benefit that you are partnered with someone that you don't know all that well because then there's a pressure to always put your best foot forward. You know, you're working a little bit harder because this person, you're giving off an impression to this person so you want it to be good, but if it's one of your friends, you know, you go out and play basketball, "Oh, we'll put it off until next week" you know, "I don't feel like doing it right now" and the other guy, he's not going to give you a hard time about it, so you actually get less work done with, with your friends as opposed to, you know, unless you have really strong work ethics…

2. More Efficient Use of Time

The second theme to emerge was that pair programming often took less time than solo programming. Some students commented that pair programming was a more efficient use of their time because mistakes were corrected faster with a partner watching the coding. The contributions of the partner helped these students overcome problem solving obstacles with new ideas or different viewpoints.

> S_1: …We got through this stuff in so much faster time than we would have separately. Much, much faster, and… I think because, if you're working, you know, you're working in pairs you get started on it earlier…(referring to solo assignment) but I think if I had been working on it with someone else I probably would have started earlier because we would have to meet up and whatever. You know we'd have to arrange times and we would have made them earlier, I suppose.

> S_2: I mean if you're given enough time on your own you will still be able to finish the thing, but maybe not as fast as two persons are doing it. Time is critical and planning is very, very important for this, for this course.

> S_3: …You don't get stuck on something that inhibits you from completing everything in the assignment. If you get stumped for a while on something and it might take up too much time and then you don't get done. It's better if you have somebody working with you that can help you with that so you guys can move on and you can actually get the full assignment.

> S_5: I wouldn't say my reading comprehension is great, so if there's someone else to read along with me, I'll just start drawing it out. And he'll get, he'll interject his, uh, what he saw differently than mine. So that probably cuts out like maybe an hour, or a half an hour, of having to go back and read the message board or the, uh, assignment again.

Conversely, students considered the deficits of time and time management in relation to their experiences with solo programming. The first excerpt describes the difficulty the student experienced with the third assignment and the excerpt describes how more time is needed to coordinate the solo efforts of the team project.

S_2: …for myself, I think I'd prefer to, um, be in the pair programming situation, um, as opposed to a solo one because…Especially after you've done two pair programming assignments and then you go back to the to the old style of doing solo, it kind of feels a little bit hard. It suddenly feels like the, you know, weight is heavier, like you have to do all this stuff on your own and there's nobody to talk to and to ask a question to. So, um, you have to kind of like stare at the computer for hours and just, you know, just thinking all by yourself…

S_3: I'm actually in a solo group, um, and, and the solo group, since we're not doing it in the pairs we actually have been dividing a lot of it up and we end up having to, um, change a lot of stuff to put it all back together so it's really a lot harder, I think…

3. Uses More Time

On the other hand, students perceived that the pair programming used more time.

Note that S2 initially stated that pair programming used less time, but here she reflects on an instance that took more time. It appears that S7's perception that he/she has to accommodate to another's schedule uses more time may be quite prevalent among those who prefer solo programming.

I: So what about your first assignment?

S_2: Um, well actually I think I ran into a problem… We didn't, uh, we completed the assignment, but our output is not completely correct… We completed the writing which is compiling and running and it prints out answers, but … we ended up sitting in the lab and it's due at 11:45. We were doing the thing, testing it right up to that time so it's very, very … (You) feel lot of pressure then, um, because we didn't get to meet that much in first week. That's, that's the main thing… We just didn't realize timing. Timing issue is that critical, because…it's our first time for both of us to do pair programming and …we sort of tended, like, more like when we do the solo … We were like, you know, both of us don't have time to meet today, we will meet tomorrow, or push it back to the day after…

S_7: As far as the pair programming aspect of it, I think it's very good, but yet inside of this college setting, it's probably not the best because everyone has different schedules and you know some people work 20 hours a week on another job and so you can't really meet with them all the time. And so, therefore, in some ways, um, being in a paired group can be slower than if

you're solo, because you can't work when you have, you know, a two hour break or you have to wait until 7:30 instead of working at 4:30 to, before you can work on the project…

4. Ability Level Factors

Perhaps the main concern expressed by all students was the ability levels of their partners on pair programming assignments. However, their comments indicate that there were several meanings to the definition of a "good partner." Some wanted a responsible partner, others thought that someone to compliment their understanding was needed. The greatest concern was that given a low ability partner, too much time would be taken in explaining and teaching the other student. It is very much of an individual call as to what constitutes a "good" partner. As S7 concludes, that the value of partnering increases some students programming skills but not beneficial to the more skilled programming partner. Yet having a partner with complimentary ideas concerning planning, design, or problem solving is desirable.

I: What do you think makes a good partner?

S_1: I think it's…if you kinda got the same level of programming…it's easier…if you don't need to be explaining all the time what you're trying to do, or they don't need to explain, you know, you don't feel bad asking…if you're sitting there and you know this person's like, they know way more than you do, you kind of feel intimidated to ask questions…if it's the opposite way around then, they don't know what's going on, it can be kind of annoying.

S_2: I'd prefer to be in pair programming uh if I get good partner, but that really depends…

I: I mean, what qualities in the pairing make it work, make it mesh?

S_3: Um, well I was thinking about the like Myers-Briggs stuff, and I'm not really sure if that, I don't know what you guys see in the um … If you look at how that works out and how people are happy with being matched via that method, but uh I don't really think that, that is that important, whether you're an introvert or an extrovert, or whether you are all about organization or not

and stuff like that. I think it's more that if your schedules work and if your, if your caliber of programming skill is, um, close to the same. Not, not necessarily exactly the same but if it's around the same level because otherwise you have one person that's just like doing everything really fast cause they know how to do the program in 5 minutes and the other person is not really taking it all in and participating that much. … I was paired with somebody who really was very close to my caliber of a programmer and, um, had some background in classes and stuff and we really worked well together in the pair.

S_4: …but with like, a match up with someone who's fast with another partner who's so slow he could like drag you along, so slow and I'd be like "This is terrible. I can't take this." Yeah, and a lot, a lot of problems I think like with the pair programming, like, uh depends really, like some people are too fast for some people…

S_6: The place where pair-programming fails is where one person knows everything and the other person isn't contributing… My most successful pairing, um, my partner wasn't very good at programming, but he knew more about JAVA than I did. So, whereas I was doing most of the planning the logic, he was saying " Well, there's something built in that you can use here" or cause…I learned in C++ and I'm just now coming back to the university, so it's kind of,… so, like, I know JAVA, but I'm not really comfortable in that realm, so he saying "Well you can use this, or you can try catch", which C++ doesn't have any of that, that mess. So it works really well if you're on a similar, you know, skill level or if one of, or if you have, you know, complimentary gaps in your, in your knowledge…I think…it would help to have some kind of a new person, kind of paired with an older person, to get kind of a sense for how things are done…so like, the new person you know, have all the, you know, kind of like my second pairing, where kind of the other person has this drive, this interest and this desire to learn, and the old person is kind of like, you know "Here's what we've been doing, and this is how we expect your code to look" and uh, the other person would be like "Well, there's this practice out here, can we, you know, insert this, or why have you been doing it this way? This way's so much better", and so I see, I see that potential right off because, you know, for me working with someone who knew, you know, some of the technical details, you know, whereas I felt confident in my general knowledge, that that worked out well. So I see definitely a potential at the entry level and also higher up, again, if you have two people of comparable skill levels…

S_7: …it's a two-edged sword when you come to pair programming, you can have a partner that you know if the partner is, um, less skilled than you and doesn't know the language then there's really no benefit. It's probably, you'd actually

be benefited if you were solo …in a situation like that. I think pair programming is …I think that's an excellent way to train a, you know, weaker programmer into being a stronger programmer. Pair them up with someone better than themselves. Let him see how things get done and then he can, when he goes on solo, he can take what he's learned from that experience, and it makes him a stronger…

5. Assignment Difficulty

There were concerns expressed in the interview about the perceived difficulty of the solo assignment. While several students admitted to procrastinating on starting the solo assignment, others perceived that the pair assignments were easier than the solo.

S_4: If, if you were to do research on pair programming and solo programming, there's no way I'd be like making the easy one pair programming and the hard one solo. It's almost like … the pair programming is better than solo…If you try…and compare the two I think you should like, uh, basically do two programs which are equal. Don't make one too hard just to try and prove your point … but do them fair, each more balanced …

6. Dysfunctional Pair/Inappropriate Initiative

As with all new methods, students found that there were some difficulties with their partners. Most of the comments were directed at their first experiences with the method in which some partners just did the assignment without input from their partner. Here we report on two perspectives, S1 whose partner preempted any cooperative work, and the work had errors that S1 thought were a result of her partner's inappropriate initiative. S6 on the other hand was not able to get the cooperation of two other partners and ended up doing the whole assignment. It appears that students have to learn how to maximize the beneficial effects of pair programming early in the course. To maximize the benefits students use their bad experiences and trial and error to learn about cooperation. Students need to feel comfortable "turning in" a non-contributing partner who to the instructor.

Slackers need to be identified early on as non-contributors to the assignment. It is important that all students have experiences before entering the workforce in which they learn to deal with slackers, learn to trust others in terms of shared responsibility, and learn to speak out against uncooperative co-workers.

> S_1: …my first, um, assignment didn't go very well in that he went away and did the whole thing and didn't ask me anything about it… I had all the ideas in my head and we were supposed to meet up and start coding, and he came back and said, "I got it done"… He kinda said…that he didn't want to have someone he can't explain all his thoughts to someone as he was doing it. But I think it turned out afterwards he probably should have cause we had one or two errors in it that I would have spotted straight away, but I you know it's very hard to read someone else's code and find errors whereas if you're working through someone else's code with them, it's much easier.

> S_3: …the first pair I had didn't work out, so I had to do it myself. So that was, um, kind of difficult… So that wasn't the best, that gave me a little bit of a not so good view of the pair programming just because my partner ditched on me, but, um, the second time with pair programming worked better.

> S_4: Uh, I can't speak for everybody, but I think some, some people prefer to work alone and some people prefer to work, like uh, in pairs. Further, I think that, to me, at least what I see, the, the way people who like to work in pairs because they don't have to do all the work…I see like one person gets to basically do one part and another part or one person won't even do his part…I guess the problem is some people didn't do their work.

> S_6: …like my first pairing I actually had 2 teammates. So we were a group of 3 because of the composition of the lab and I still ended up doing the whole thing by myself… Another problem is just people who aren't interested in the work… I know that everyone, that the majority of people, given an option, tried to get into a pair (team). But I think, I think some of that is people trying to look for someone to make up for their deficiencies and lack of work … In my case, I was looking to kind of keep an eye on someone to make sure that they weren't, you know, making a mess of things. So, so I do know that, that there is some animosity towards the practice just cause you get paired with idiots sometimes…or you expect them to do some work and they don't. So, I've heard a certain amount of frustration there…

7. Management of Project

Management of the project is a major issue for the students in terms of time demands of the assignment together with all the time demands that students perceive to be overwhelming. It appears that with each assignment, students become more adept at managing their time.

I: Well, you're working on the team assignment right now, right?

S_2: Yeah.

I: How's that going?

S_2: It's been going great so far if you, um, like, I, I feel in the homework… I was always kind of rushing it in a little bit. So, um, for this project so far I think we actually, um, finished like the first, um, part earlier… The first part is due on Sunday and then we met today in the lab for four hours and we actually were doing the next stage now. So, so that feels really good. So you're like you know, once, for once, like you're finally like getting things ahead So it feels good…so far in our team…we write email to each other every single day, like we have…our team leader's good…everybody's, uh, you know, working towards the goal, um…nobody's really not, you know, doing stuff, you know We kind of, we're going at a really right pace, I feel. If we continue to do that I think we'll be able to finish the stuff a little bit earlier than the due date so we will be able to do attempt the, um, extra credit stuff, so…

S_3: I think for the most part people enjoy pair programming and think that it is more effective, um .. Some people have complaints about it, um, because it's hard when you're in all these other classes and we're juniors and seniors that have jobs. It's hard to always get together and actually sit side-by-side for hours and program.

I: So, is it working out okay?

S_3: It's working out okay, but it is a lot of work to uh put it back together. I wish we were doing more work collaboratively.

I: So do you find that one of the hindrances is actually that you have to get together outside of class?

S_6: Yeah, that's, that's a major hindrance…

8. Better Learning

Most students chose to do the team assignment using pair programming techniques rather than solo programming. Many of those interviewed noted that their learning was maximized with a partner rather than when they worked alone. The old maxim "two heads are better than one" really works for these students. Despite having experienced problems with uncooperative partners, they appreciate new ideas of partners who bring different experiences to the setting. For those who actually pair-program, they report a dramatic decrease in coding difficulties.

S_1: …It's nice. Like if you're working something on your own it's much harder you know, its better to have other input and you know have other people telling you… Like me explaining to her and her explaining to me, you know, everything that we thought and it worked much, much better… Everyone that I've talked to, they like having someone else to kind of (act) as a backup. If you don't know how to do something, it's very nice to know someone else working with you. You know, either they know how to do it, and if neither of you don't know how to do it, you just go and look it up or whatever. But it's nice to kind of have, to be able to rely on someone else to, to be able to do things as well… If you're writing something and the other person is like "how is that going to work?", you would explain the whole thing to them. So, I mean, if you're explaining your reasoning you see flaws easier, you see flaws in your reasoning. Whereas if you do it on your own you're probably going to go away and code the whole thing and then suddenly you realize, oops, (laughs) I don't know what I was actually doing here… If you have to explain it, you would think you know, you kinda have to tell them exactly what's going to happen the whole way down the road. It means that they can point to what they think is going to go wrong, too. I think the other thing, too, is just very obvious things. You know, literally as your typing something at the screen, they can correct it as you go along.

I: Do you think you learned it any better?

S_1: Probably…if you don't know how to do something and you're, say, going away to search something on the internet or look it up yourself, it's easier to have someone else explain it to you. If, you know, they know what they're

doing it's much easier to have a human explain it to you rather than trying to read it and trying to go through a lot of useless information to get what you want.

S_2: …in a situation where you don't understand some stuff and then you can ask the other person…you tend to be more open with the other person. Where if you're, you know, working well together, then you tend to be really open, like, and you can learn a lot from that… You can compare with the other person and, and you know, um, if you don't know and you want to learn, um, this is a good time to learn. You know, you can, you can ask her how you do this stuff, you can see cause…you're sitting right there so you can see how the other person's doing it. So um and also in the pair programming, you are not just sitting there watching because I mean if…you don't get what she's doing you just ask, and she's supposed to explain everything cause that's the whole purpose…

I: So that's why you picked pair?

S_4: Yeah, well, there's, um, meeting people.

I: You like to meet people?

S_4: Yeah, I get to meet people and, uh, learn new things.

S_5: …if there were any learning curves, it made it kinda lower since two people were there to bounce it off each other. I think I like paired better…it's not, not as frantic to get it done…If I can't figure something out you can just call somebody and ask them. I think when you have two people there, you're less likely to uh, get stuck in a, in a certain state of mind…where you're thinking about it the wrong way. Uh, that's helpful just overall. If you don't understand it this time, you get a better understanding of for it next time, instead of kinda just trying to scrape by.

S_7: …working in paired, in a paired situation you can learn a whole lot more…

9. Dependency on Partner

Although this concern was not expressed by many, one student worried that pair programming may be too much of a good thing. That is, he/she would lose the ability to think and solve problems independently.

S_2: I'm just wondering that is it also true that on the other hand that you know after you get used to pair programming then you, you have to go back to the solo programming you will sort of feel too dependent. You know feel too, um, relied, sort of, need the other person to the job as opposed to be very independent of, you know, "I can do this job myself". I mean like it has benefits, but it may you know have drawbacks in case later on you need to complete the work on your own.

III. Emergent Themes: CSC326 Lab Observations

Several emergent themes are reported here about students' behaviors during lab time. They include: Management of Assignment, Responsibility within Group, Inappropriate Initiative/Dysfunctional Group, and Willingness to Work Together. Students worked in a variety of situations, depending upon the lab assignment. During the first half of the semester, students generally worked on lab assignments in groups. When the groups finished their assignments, students then went to work on homework assignments. Summaries of lab observations are included in Appendix B. The first two homework assignments were done in pairs, while the third homework assignment was completed solo. During the last part of the semester, students spent lab time working on a Team Project. Half of these teams utilized student pairs within the team, while the students in the other teams worked individually. The group lab assignments were: CRC Cards, Class Diagrams for Course Management System, Case Diagrams, and Extreme Programming. The paired homework assignments were: Abstract Factory and Adapter Pattern. The solo homework assignment was Composite Pattern. The team project was Acceptance Test Cases.

1. Management of Assignment

During the labs, groups were required to work together to complete lab assignments. Most of the students collaborated together within their groups and remained on task. There were several groups who did not collaborate together nor did not stay on task. For example, during the Extreme Programming assignment, the students of an entire lab did not begin the assignment until 25 minutes into the lab. Students were observed chatting with other students who were not in their groups. Many students were walking around the lab and some were checking their emails. The students in this lab were not focused on their assignment. Another example occurred in a group working on the CRC Card assignment. There were five students in the group who split into two separate groups. The two groups worked separately on the assignment and then came back together and collaborated at the end of the assignment.

2. Responsibility within Group

The group lab assignments were designed for group collaboration and interaction. The majority of the students exhibited responsibility to the task and to the members of their group with a few exceptions. One of the groups working on the CRC Card assignment was composed of four very confident students. These students proceeded to work individually on the assignment with very little collaboration or discourse. When they were finished with the assignment, they shared their work with the members of the group, but did not seek or offer any feedback. For some students, individual competitiveness learned over years of schooling overrides cooperative contexts.

3. Inappropriate Initiative/Dysfunctional Group

During the group assignments, several groups had dominant members who controlled the discourse and direction of activity of the members. The members of one group with a dominant member sat and listened quietly while he told them how to conduct the assignment. He corrected the other students' mistakes and refused to listen to their ideas. In most cases, students' behaviors reflected respect for others.

4. Willingness to Work Together

Almost all of the lab observations revealed that the majority of students were willing to work together to complete the assignments. One of the labs seemed to operate as one large group instead of four smaller groups in almost every group assignment. Students in this lab talked with each other across the room about the assignment. Several individual students worked not only with their own group members, but also with other students in different groups. On the other hand, one of the groups from a different lab worked individually on the Extreme Programming assignment while one of the members asked questions of a student in a different group.

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Appendix A:

Interview Protocol and Transcripts

INTERVIEW PROTOCOL: MIDSEMESTER PILOT, OCTOBER 2003

OPENING.

SAY: We are evaluating the instructional approaches used in your computer science 326 course. It is important for the instructors to know how well these new methods are working for you. This is why we want to ask some of the students what they think about the programming assignments in this course.

Your responses will be anonymous. While we will share the results of the interviews with the instructor, he or she will not know that you were interviewed.

1. What do you think of the assignments so far?
    a. Can you explain why you think that?
    b. Can you give me an example?

2. So some of the assignments have been paired and some have been solo. What do you think the students in your lab prefer, pair or solo?
    a. What reasons do they give for preferring _____?
    b. What about those who prefer _____?

3. What about you? What approach do you prefer?
    a. Why is that true?
    b. Any other reasons?

4. What makes _____ an effective instructional tool for you?
    a. Have you noticed other approaches that help you learn?
    b. Can you give me an example?

5. What do you see yourself doing after graduation?
    a. Have you ever done this before? How did it go?
    b. How do you envision the workplace?

6. Do you think pair programming will work in today's IT workplace?
    a. Why? Please explain this idea some more.
    b. Why not? Please explain this idea some more.

Thanks very much for your time. You were very thoughtful. Your ideas will help many students here at NC State and in other programs across the United States. Good luck with the semester.

CSC326 Student Interviews
Date: 10/24/03
410 Poe Hall

Student: S_1

Interviewer: Dr. S. Berenson

I: What do you think about the assignments so far in 326?

S: In regards to pair programming? Or in general?

I: In general.

S: They be okay, em…

I: What does that mean?

S: The, the ones we worked in pairs were easier. I think because, if your working, you know, you're working in pairs you get started on it earlier because you kinda go the responsibility of the other person, whereas the last one we had, we had it one our own and well, we had midterms and everything as well so I didn't get started on it until very late and I didn't, I didn't get it finished.

I: You didn't finish it?

S: But I think if I had been working on it with someone else I probably would have started earlier because we would have to meet up and whatever, you know we'd have to arrange times and we would have made them earlier, I suppose.

I: So what you're saying is working in pairs makes you more responsible?

S: Exactly, like you, it, it, its kinda more formal as in you make arrangement meeting times, whereas if you're working on it on your own you, you don't organize. You say oh, I'll start today or I'll start…and you know

I: You keep putting it off.

S: Yes, it's much easier to put it off. It can be, it can definitely be a better thing to have, you know, set times that you have to meet someone and you feel like if you don't turn up, you know, they're going to be upset or whatever, and its going to be, its going to reflect on their grade as well as your own. So, you know, you have to think of someone else.

I: That's really interesting, I don't know if we are going to hear that from other people. I think that's rather unique approach, but I think you may have hit on a very important part. Um, can you tell me, for the team project, are you pair or solo?

S: Pair.

I: You're on the pair?

S: Yeah.

I: Okay. How's that going?

S: Well, so far we haven't divided up into pairs right yet anyway, so far, everything we've had is just a big group meeting. It's like, we're only doing the web page at the moment. So everything we've done we've tried to meet up with as many people as we could and uh, basically we just tried to finish the web page, with the group, with the whole group, and we hadn't really decided yet who going to split up yet for kinda coding it because we wanted to do all the planning and design together as a group as well, you know, it's like rather than having two sets of pairs, er, there's five of us so that's a little bit awkward as well and having …(inaudible) and having two totally separate things so it's, we get planning done as much as we can together, then ...

I: Was that an option to do it all together, the planning?

S: Well, we kinda, they've left it open to us as to how we split up, you know, I mean I think basically if we do decide to kinda sit down and do the whole thing, the five of us, all the time, we couldn't (inaudible), it's obviously not possible.

I: It would take longer for everybody.

S: Exactly. Exactly. But, em, I think once, once we start actual, actually coding we'll be setting up (inaudible).

I: Okay, so you think the web, uh, design, page design went well?

S: Yeah, it went very well, em, it's nice like if you're working something on your own it's much harder you know, its better to have other input and you know have other people telling you what you(inaudible)

I: Well, it's sounds like you prefer pair programming.

S: I do really. I didn't at first, because…

I: What was your reaction at first?

S: I've never, I mean, I'm actually originally from Ireland, and I'm coming over here, like in first and second year at home we did no sort of group stuff or anything at all, it was all totally…

I: On your own.

S: On my own and it was very strange having to work with someone else and my first, em, assignment didn't go very well in that he went away and did the whole thing and didn't ask me anything about it.

I: Oh really, how did you feel?

S: Oh, I was very annoyed.

I: And did you tell him?

S: I started to think about it and I had, you know, I had all the ideas in my head and we were supposed to meet up and start coding, and he came back and said, "I got it done" and I was like, "Okay" (laughs). But, em…

I: Did you tell him how you felt?

S: I said a bit, but I didn't say too much in that he had put a lot of effort into it, too, you know, and I think he, well he kinda said, which I kinda I understood was that he didn't want to have someone he can't explain all his thoughts to someone as he was doing it. But I think it turned out afterwards he probably should have cause we had one or two errors in it that I would have spotted straight away, but I you know it's very hard to read someone else's code and find errors whereas if you're working through someone else's code with them, it's much easier.

I: Mm, mm. Well, do you think maybe he liked it?

S: I don't know, I would hope so.

I: So that wasn't a good experience for you, but what about the second one?

S: Em, I was working with a different girl and we were, we met up for just about everything and we worked through it much, much better. (inaudible) like me explaining to her and her explaining to me, you know, everything that we thought and it worked much, much better.

I: And so the third one was okay, too?

S: Well, the third one we did on our own.

I: Oh, you did it on your own?

S: Yes. That didn't go well. But, em, I didn't, with Fall Break and everything I went on holiday, so I didn't get started on it until kinda the day before, which was, I mean I knew

I wasn't going to get it done, but I had so much else to do, I didn't, you know, I just wasn't prepared.

I: Sounded like you weren't the only one, right?

S: I definitely wasn't the only one. I think it was the whole class, I think there was like, five people finished it, or some silly figure like that.

I: Um, what do you think the students in your lab prefer, the other students?

S: I think pair.

I: You think pair? Why do you say that? I mean, what is your evidence?

S: Well, I know, in class what she said is, originally she said, some groups for the project would be pair and some would be solo and everyone's like "Awww". For the solo, everyone kind of, like everyone that I've talked to they like having someone else to kind of, as a backup, if you don't know how to do something, it's very nice to know someone else working with you that, you know, either they know how to do it, and if neither of you don't know how to do it, you just go and look it up or whatever, but it's nice to kind of have, to be able to rely on someone else to, to be able to do things as well.

I: Do you consider this a hard computer science course?

S: Not particularly hard, it's, it's okay, em, the design pattern stuff is kind of weird to me, I've never worked with that before. I think that's a general thing for the whole class, I don't think it's just me. The actual coding is fine. (inaudible) so I think that's okay. But, em, getting used to working in a group is going to be strange, having to kind of, you know, designate tasks and you know, kind of swap around with people and stuff. It's going to be kind of hard, but the actual, the actual material of the course is fine. It's the new things, that, that are harder to adjust to.

I: So every, every piece is kind of new.

S: Exactly. The pair programming, at first, I told you (inaudible)…so that I think the group would probably be the same. When I first kinda heard group, I was like oh, trying to coordinate and get everyone together and you know, it's so awkward but it's so much nicer to actually be able to work together, then when you actually do meet up, so yeah…

I: And, but you're also saying that you had to get used to the format of the class, the design format, is that…?

S: It's, what it is we, for the coding we're using like these design patterns, that, it means you can't just implement your code the way you want to, you have to structure it in a particular way. And it's kind of, it's kind of strange to, it's kind of hard to think from going from just visually writing code to having to structure it in a particular way to try to, you know,…

I: So that was new to you?

S: Yeah.

I: But it's new to the other students?

S: I think it's new to everyone else as well.

I: Is there a name that they give that?

S: It's just design patterns. It's, em,…

I: Okay, um, what, can you think of anything else that makes pair programming an effective instructional tool for you other than, that it keeps you on task and makes you a better planner because you're thinking of other people?

S: It's definitely good for coding as well. You know, if you're writing something and the other person is like "how is that going to work?", you would explain the whole thing to

them so, I mean, if you're explaining your reasoning you see flaws easier, you see flaws in your reasoning, whereas if you do it on your own you're probably going to go away and code the whole thing and then suddenly you realize, oops, I (laughs) don't know what I was actually doing here.

I: So, you're saying the explanation to somebody else…

S: Exactly, it kinda, you know,…

I: Do you catch yourself when you're explaining?

S: Yeah.

I: You do?

S: Yeah. It, like, you know, if you're thinking about it, you don't as far ahead, I think, as if you have to explain it to someone. That if you, if you have to explain it, you would think you know, you kinda have to tell them exactly what's going to happen the whole way down the road. It means that they can point to what they think is going to go wrong, too. I think the other thing, too, is just very obvious things. You know, literally as your typing something at the screen, they can correct it as you go along.

I: It's hard to correct your own work, isn't it?

S: Definitely.

I: So somebody else can see those…

S: (Inaudible)

I: Okay, what do you see yourself doing after graduation?

S: I probably want to do postgrad work, I'd day, I'd say probably back in Ireland. Em,…

I: Whereabouts?

S: I'd say my home college, it's back in Cork, Ireland. Em, I know if I, if I get certain marks then my, then my (inaudible) pays the master's program, so I'll probably go on and do that. The economy isn't great at all for jobs, so…

I: You did have the technology boom, though, in Ireland, didn't you?

S: We did, but it's dropping off again. It is going the same as everywhere at the moment. Just, there's lay offs and there's cut backs.

I: Well, after you get done with all your schooling, what do you see yourself doing in the work place?

S: I want to go into software development. Like I think this kind of, you know, the actual coding and all that kind of thing is where I'd be most interested.

I: You'd like to do it in Ireland?

S: Probably, em, unless I couldn't get a job in Ireland. I'd, I'd wouldn't mind moving then, cause, I think, that I'd probably be, I'd probably prefer to stay…like now that I've experienced being away, it's kinda like "Oh, I want to go home".

I: You miss it?

S: Yeah, I don't want to go home, but I miss it. Yeah.

I: Well, everybody misses home.

S: Exactly. Exactly.

I: So, have you ever worked in software development?

S: I haven't yet. I, if I was at home this year, I'd be doing work experience, which is like a co-op here. I'd be doing that for the next six months for January through August, but em, I decided to do a second semester here instead. So I won't get the opportunity to do that.

I: How do you envision the software development workplace? You know, you haven't been there, but you must have, I mean you're saying "well, my future is there". What do you think it looks like, because I have no idea what it looks like.

S: I really don't know either.

I: You don't?

S: To be honest, like, without (inaudible) and having done work experience this year, it's like very unfortunate that I'm not going to get that opportunity, but em, I mean I suppose at the same time, like it's probably the same for everyone, that they don't really know what they're going to get themselves into, so I'm not too worried that way.

I: Do you think pair programming could play a part in that IT workplace that you're going to be in?

S: I think it could, I mean, I know another course that I'm doing at the moment, it's actually programming in C, but I'm working with, like, 2 or 3 other people in my building also doing it, and I, I been working with one of them and we kinda, we didn't actually, we didn't plan the whole pair programming or anything. But when were working on it, it was very much, I thought afterwards, as very much the role of driver/navigator, that kind of thing, that, like he was typing, and I was kind of watching what he was doing and you know, asking him questions and all that. But I think, it can be a very natural way to work. If, if you're, if there's two people working it can be…

I: So this time you found a guy that can partner with you? (laughs)

S: He's the best partner I found so far.

I: Really?

S: (inaudible, laughing)

I: What do you think makes a good partner?

S: I think it's kind of, if you're, if you kinda got the same level of programming, which, I mean, you don't have to have, but it's kinda (inaudible) easier than, you kind of, if you don't need to be explaining all the time what you're trying to do, or they don't need to explain, you know, you don't feel bad asking. You know, like, I mean if you're sitting there and you know this person's like, they know way more than you do, you kind of feel intimidated to ask questions or to ask about a question. And if it's the opposite way around then, they don't know what's going on, it can be kind of annoying. So I think it, if someone kind of has, somewhat the same, same level you know, the same kind of idea of what they're doing. But, em…

I: So you're saying you're using it, in a way, in another course?

S: Yeah, we didn't, we just kind of paired up for it. We didn't plan to use any of the pair programming, it was just the way it worked out. And, like, I wouldn't even call it (inaudible) pair programming, it was just the fact that, like, we'd been doing it in the 386 course and we'd kind of heard a bit about it, but I kind of look back on the experience and kind of says, you know…

I: But you only had one other opportunity to do it, because the first one, he took it all away from you. Right?

S: Yeah.

I: Well, that's really interesting. Now, has your partner gotten, is he in 326, too?

S: He's not, no.

I: Oh so, but he, he…

S: He doesn't know anything about the pair programming at all.

I: He doesn't?

S: We just sat down and, you know, and programmed and it was just the way we worked and it was, it worked out really well.

I: Oh that's great.

S: It really did, I mean, we kind of, we got through this stuff in so much faster time than we would have separately. Much, much faster, and…

I: Do you think you learned it any better?

S: Probably, because I think, well, you know, if you don't know how to do something and you're, say, going away to search something on the internet or look it up yourself, it's easier to have someone else explain it to you. If, you know, they know what they're doing it's much easier to have a human explain it to you rather than trying to read it and trying to go through a lot of useless information to get what you want. You know, you can be…

I: More focused?

S: Yeah. Yeah. Definitely.

I: Great. Do you have any questions you want to ask us?

S: No.

I: You've been a great interviewee.

S: Thank you.

Student: S_4

Interviewer: Dr. S. Berenson

I: In the team assignment, are you on a paired team or a solo team?

S: Right now I'm on a paired team?

I: You're on a paired team? Good. What do you think of the assignments so far, all of the assignments?

S: Well, um, when it comes to the assignments, I, uh, think really that the last one, the composite assignment and the adapter assignment, the pair and solo programming, I think, to me wasn't, I think, that wasn't a good way to compare the two. Because like, the adapter, the adapter program, to tell you the truth, I could have done that in my sleep.

I: Really, it was easy?

S: It was so easy, I could have just woken up and just done it. But with, uh, the solo, it was a totally different thing, it was just basically like telling you, basically like, from this one you were doing, uh, you expect solo to be similar to the previous one, but this one was much more difficult, much more intense. I think a lot, a lot of other people in class would probably say the same thing about it.

I: We heard that a number of the students felt that it was a difficult assignment.

S: Well, I know, I know (inaudible) students tried cause uh, for some reason it was just way too difficult for them. It was way difficult than the previous ones.

I: What made it difficult?

S: What made it difficult?

I: Mm-mm.

S: I think that, that the previous ones were easier than this one. If, if you were to do research on pair programming and solo programming, there's no way I'd be like making the easy one pair programming and the hard one solo. It's almost like ??? the pair programming is better than solo, sort of, you know, ???, I've decided it's better whether

you like it not, ??? if you try and do the same thing, try and compare the two I think you should like uh basically do two programs which are equal, don't make one too hard just to try and prove your point ??? but do them fair, each more balanced ??? but, like, you should compare them after working ??? the work in the pair programming and the previous one, the work was much less than the work you've done in the solo, and so the amount of work you do had like five, six classes at least and in the pair programming we had like three classes, so there's a huge difference.

I: So there was more content you had to use in that…

S: Exactly.

I: And it was difficult, more difficult, it took more time?

S: It more time, exactly, it took more time. Especially like since you're working alone.

I: How much time did you spend on that assignment?

S: Uh, I can't (inaudible).

I: What?

S: I was flip flopping between two assignments. I can't really say, ah, it probably took me a couple of days. Yeah.

I: The solo took you a couple of days to do?

S: (inaudible)

I: What?

S: The pair programming one, I did like very easy, the solo one took me a couple of days.

I: Couple of days?

S: Yeah.

I: And so, we're talking about at least 16 hours, 20 hours?

S: Exactly.

I: And the pair programming assignments, the two before that took you how long?

S: The one, one before that one, took me basically one evening.

I: One evening?

S: One evening.

I: Three or four hours?

S: Three or four hours, maximum. That's how easy it was. And the previous one was like basically, uh, two days.

I: Two days?

S: Yeah.

I: So the first one took a long time?

S: Yeah it took a lot more time than the second one.

I: But, what did you think, that the solo one should have been the short one rather than like the long one in the first?

S: Uh, if it were the short…I think it would ??? I think uh one of the problems was way too easy and one was way too hard. There's no way you can try and compare something by making something too hard and another too easy, make them fifty fifty, in between, you can't make one too hard and one too easy.

I: So if you were the instructor and you had the first two, the first one was hard, the second one was easy, a lot easier, and the third one, solo, was very difficult. If you were the instructor, which one would you change? Would you change the second one or would you change the third one?

S: Well uh, I think, I would, uh, make the second one a little more harder.

I: You would?

S: Yeah.

I: Okay, that's good.

S: Cause it was way too easy.

I: Way too easy. So everybody said "Oh the next one's going to be a breeze, too"?

S: Yeah, I don't think everyone thought it would be a breeze, but it was harder.

I: So what do you think, generally, the students in the labs prefer to do, how they prefer to work? They students in your lab, would they prefer to work pair or would they prefer to work solo?

S: Uh, I can't speak for everybody, but I think some, some people prefer to work alone and some people prefer to work, like uh, in pairs. Further, I think that, to me, at least what I seen, the, the way people who like to work in pairs because they don't have to do all the work ??? and uh by the end of the day ??? division of labor and identically everybody's got the same uh product that's working but uh, one problem with that, with that, to me, the way I see like one person gets to basically do one part and another part or one person won't even do his part, he ??? I guess the problem is some people didn't do their work.

I: How has it worked for you?

S: Well, ???

I: What about your first pair, did that work well for both of you?

S: Yeah, it worked well for both of us, because I, like I said I get along with all different kinds of people, I ???

I: So, they did their work?

S: Yeah, they did their work, they did their work, yeah. At least, that's a good thing I was just lucky to be assigned good pairs unlike some other people I know, these guys just telling me, uh, how bad, dropped, uh, one half way through the program, another one was like uh, pair didn't show up til the last day, so I'm just glad I had good pairs.

I: So your pairs were good?

S: Yeah, they were good.

I: But some people had problems with their pairs?

S: Exactly.

I: They didn't work?

S: Yeah, people don't work.

I: They dropped?

S: They dropped, people uh become sluggish, ???

I: Yeah, didn't have good ideas or contribute? Just go through the motions?

S: Yeah, and a lot, a lot of problems I think like with the pair programming, like, uh depends really like some people are too fast for some people because some, some, one programmer can be so fast he'll think about it so fast and like before he, ???

I: So you're saying if one of the pair is thinking way fast ahead, the other one is just trying to understand what he's doing?

S: Exactly.

I: And it never ends. So, what do you prefer?

S: I'd say, I can adapt to any situation, it doesn't really matter to me.

I: It doesn't matter to you.

S: It doesn't matter to me.

I: But apparently you did choose pair for this assignment, this team thing, didn't you?

S: Yes, the team project, that's so easy, the team project, you cannot expect to be a team if you're working alone, you got to…

I: How does that work? I mean, if you're working alone do you have to do the whole assignment on your own?

S: Well, I guess ??? I don't have it down yet, I only have my ideas.

I: So you didn't know how it would work? But you knew how the pair would work?

S: Yeah, I knew how the pair would work.

I: So that's why you picked pair?

S: Yeah, well, there's um meeting people.

I: You like to meet people?

S: Yeah, I get to meet people and uh learn new things.

I: Learn new things?

S: Yeah. ???

I: Right, from other people, on the team?

S: Exactly.

I: Is that happening on your team?

S: Oh, yeah, it did happen. ??? That's a good thing.

I: How is your team working, so far?

S: So far, we're working pretty good.

I: Are you working in pairs now, or did you do anything together?

S: Yeah, we meet so far twice.

I: As a big group?

S: Yeah, I've ???

I: Now did everyone on the team show up?

S: Yeah, everybody shows up.

I: They did? Are they good about doing that?

S: Yeah, they're good, so far.

I: What about the other teams? Do you think they good at showing up on the other teams?

S: I have no idea what's going on with the other teams. I have no idea.

I: But you know how your team's working?

S: I know how my team's working, yeah.

I: So, do you think it's a good team?

S: I think it's a good team. No complaints.

I: So, you can't really say whether you would pick to work alone or together other than, it seems like the pair, you don't have to spend as much time.

S: Well, I've spent as much time but like I think every situation has a good and bad end of it, there's no way you going to be, it's like I say, the pair ??? team up with a pair, I ??? same level as the other team, that would be a very good match, but with like, a match up with someone who's fast with another pair who's so slow he could like drag you along so slow and I'd be like "This is terrible". I can't take this. I guess it ???

I: So one thing we could tell um Dr. Williams is that pairing students of similar ability is probably a good thing?

S: I think it's better. Seem like it, yeah. ??? in pair, one person is like way up and uh one is way down, and that's bad because like uh he he gets to ??? more than the other person a lot.

I: But you like it because you can meet other people?

S: Well, that's, that's a good advantage. Yeah, ???

I: So, you say you're networking already?

S: Exactly. ???

I: Yeah, that's great, good idea. Okay, so if you could pick one of these, say, pair programming, um, what makes that an effective instructional tool for you other than um you meet people and you begin that networking process?

S: Uh, a lot more. Like if I get paired with someone on the same level, or if he knows more than me, uh ??? and like uh like I say, he definitely ???

I: So, if you have equal ability, then somebody knows something that you can learn from and you know something that they can learn from?

S: Yeah, I think that, that would be good. ???

I: Um, what about the role of being a teacher to somebody who doesn't understand too much? How do you feel about that?

S: Well, like I, like I say before, everybody can't be a teacher, but uh, you try your best. Like some people, some people know their, their, know whatever their stuff is, the material, ???

I: So you don't believe everybody can be a teacher?

S: No, no, trust me. I've seen that, I know. Not everybody. Some of them have a PhD. know, knows all the stuff real like, get an A+, I don't care, but that person may not be able to teach someone else. ???, that's a fact.

I: I'm sure you've got enough examples to prove that, too.

S: I do.

I: I think we all have.

S: Me, too.

I: Okay, what do you see yourself doing after graduation?

S: Uh, that's a good question. I can't really say right now. Other factors figure into ???

I: What?

S: There are other factors.

I: Well, if you could pick your ideal situation, what would be your dream job?

S: Uh, I don't feel that there's a dream job to tell you the truth.

I: You don't think this is a dream job?

S: I don't feel it's a dream job. If it's a dream job ??? I think uh, what I would like ??? that'd be software engineering.

I: Software engineering?

S: Yeah.

I: Okay, I'm not a computer science person so, how do computer, software engineers work? I mean, who do they work for, what do they do?

S: Uh, they work for different kinds of companies really, in different industries, ???

I: Okay, so it's different from developers, right?

S: Uh, it's almost the same.

I: It is almost the same?

S: Almost the same, similar fields.

I: So, have you ever done any of this? Or seen software engineers at work?

S: Um, not really, not really, but um it sounds intriguing.

I: Okay, and um, do you think what you're learning to do in pair programming would have anything to do with that workplace, in software engineering?

S: Yeah, sure, a lot. It sure would.

I: Why is that?

S: Well, um everything you learn right now is going to come back, one way or another, you got to know it, so the best way to learn it is basically through school, like, at least if ??? then by the time you got out into industry ??? so it's like you don't know nothing at all, so like you go to a job and they ask you something and you say "I have no idea", it looks bad, yeah. So, I think, I think you should know something, but it's like, for example, the testing methods we're learning right now, I think are very beneficial ???

I: They have to work in pairs on those, too, or teams, too, don't they?

S: Yeah, they work in teams.

I: Because, I mean, just one person can't do all the testing.

S: One person can't, they broke it up, that's a good thing.

I: And so, they do work kind of in a team approach, do you think? Have any of your other courses in computer science had this approach to assignments?

S: Uh, I had it for 216.

I: 216?

S: Yeah, I had uh pair programming. I think that was the only one, yeah.

I: How did that work overall, because you went through the whole class?

S: Well, it was okay, uh, my partner in 216 was an electrical engineering student, ???, it was okay.

I: Did you have to keep the same partner?

S: No, we switched like uh halfway through the semester. When I switched, uh, partners, the partner I switched with didn't show up and by the time I got another partner, it was like one or two days before the program was due, so, the second one was a disaster, yeah.

I: So that's where you come up with that experience about what makes a good partner?

S: Exactly.

I: And you hope when you're in the workplace that they're going to be good, too, but…

S: Hopefully.

I: Hopefully, you can only hope right?

S: Yeah, you can only hope, yeah.

I: Well, thanks a lot, you've been very thoughtful about your responses and we've learned a lot from you today.

S: Thank you very much.

Student: S_2

Interviewer: S. Berenson

I: What do you thing of the assignments so far?

S: Uh, they're pretty intense. I mean, none of them are particularly really, really difficult, but it's just that the time we've been given to do them and, especially it's very important to start really, really early while we know that (inaudible). But it's, it's you run into problems, you know, with deadlines in the end, um, if you don't do that, so, um…

I: So time is…in planning?

S: Time is critical and planning is very, very important for this, for this course. So, I mean, uh, well compared to what I've been doing before is like, generally what I've found, before I had an outside assignment, which probably even a little bit bigger than this, but we were generally given a long time to do, so I don't feel so much pressure, um, like here, is like, uh, if you got a lot bigger assignment, like every two weeks to do, but they had, they won't say "Just, uh, type up the code and submit by the end of the two weeks", they give you, actually broken it up, so, so do two stages, so you have one due date deadline for the first week and one for the second week. So, um, so that, that's kind of a good way to make sure you finish the thing. But, um, it also, sort of, you know, you, you meet constant deadlines every week, you, you do have a deadline every week.

I: Well, do they do that here, do they break up the assignments?

S: Yes, yes. If we get a two week assignment we, they, I think all of them actually are two-week assignments, but we don't really, that doesn't really make much difference (inaudible) broken it up to every week one so we had deadline every week anyway, so…

I: Well, you're working on the team assignment right now, right?

S: Yeah.

I: How's that going?

S: It's been going great so far if you, um, like, I, I feel in the homework, I kind of, um, didn't start that early, so I didn't like, to finish the stuff, actually before, I was always kind of rushing it in a little bit, so, um, for this project so far I think we actually, um, finished like the first, um, part earlier way earlier so uh like um like the first part is due on Sunday and then we met today in the lab for four hours and we actually were doing

the next stage now. So, so that feels really good so you're like you know, once, for once, like you're finally like getting things ahead, so it feels good…

I: Are you on a team or are you on a...a pair or solo?

S: I'm on a solo, but since we haven't started, we're still only on the planning phase, so we haven't started writing code yet, so that doesn't make much difference right now.

I: So you're meeting as a group?

S: Yes, yes. We're just discussing…

I: So, you've got Sunday's assignment already done?

S: Mm-mm.

I: And you did that together?

S: Yes, we did that last Saturday, so that's good (laughs)

I: So how does the solo team work?

S: Um, the solo is mainly, like, it's exactly the same as the other paired one except you don't do pair programming which means, which means um well you do the design and everything together four of you together and but it's only when you do writing the code, you you would assign each person, say we do we would write four classes this week and then each one of us will be responsible for one class and we would write the code separately and then later on to put it all together, um, see if it's working or make some changes to it, whereas the pairs once they would be you know two persons working on one class or you know two person get two classes, but they're writing them together as opposed to one write, you know each one, so, so that's the main difference.

I: So, um, some of the assignments have been paired and some have been solo, so what do you think the students in your lab prefer? Do they prefer the paired or…?

S: I don't know we got like, we had two paired ones and one solo one um I don't much about other people but like for myself, I think I'd prefer to um be in the pair programming situation, um, as opposed to a solo one because, because especially after you've done two pair programming assignments and then you go back to the to the old style of doing solo it kind of feel a little bit hard, it suddenly feels like the you know weight is heavier like you have to do all this stuff on your own and there's nobody to talk to and to ask a question to so um you have to kind of like stare at the computer for hours and just you know just thinking all by yourself, um…

I: All by yourself?

S: Yes, that's the main, I, I don't know like they were, at the beginning they were saying like pair programming would increase the like efficiency of programming a lot. You know, by cooperating like two people you know they're discussing things but I'm, I'm just wondering would that actually um yeah I found if, if you have a good partner uh you know working together very well that really is effective, but I'm just wondering that is it also true that on the other hand that you know after you get used to pair programming then you, you have to go back to the solo programming you will sort of feel too dependent you know feel too um relied, sort of need the other person to the job as opposed to be very independent of, you know, "I can do this job myself" so I, I mean like it has benefits, but it may you know have drawbacks in case later on you need to complete the work on your own.

I: So what you're saying is pair programming might take away your ability to work alone?

S: Mmm…not as in the sense of um, um your programming ability, but your ability of uh time management you know and, and really put the pressure on yourself to complete the

stuff because well planning is at every stage you're still doing the same exactly the same thing as two persons would do but the effect of two persons doing it together is that you know you say "I'm meeting my partner tonight at 7 I have to get this bit done" or you know, "I have to read up this stuff before I meet her" so uh when we meet we'll do stuff like you know um we we'll really talk about the issues we have or you know really be productive you know as opposed to you know just sitting there and um you don't want wasting other, of the other person's time that's, that's a very important thing you don't want drag, dragging the other person you know like they might have something else to do.

I: So you feel more responsible to the other person?

S: Yes. Yes, exactly. You be thinking of you know be responsible for the thing, um and but if you're doing you're solo then you're like "Yeah I can do it one hour later, I can you know have an ice cream right now". You know, you don't get that (inaudible) you know, that is a coding thing you know because we've already learned how the programming and those kind of stuff, you know most of those they're still the same. I mean if you're given enough time on your own you still be able to finish the thing, but might not as fast as two persons are doing it. In that case you know when you suddenly switch back to solo you might feel you know, you might end up like you um don't feel the pressure any more and not doing the work for the first week and then at the end you're really rushing and in the end you can't finish the job. So…

I: Did you finish the third assignment?

S: Not totally.

I: Not totally?

S: No.

I: So, are you speaking from experience when you say that you didn't plan your time?

S: Yeah. I was, I, I, yeah, it's kind of yeah, since Fall Break is in between and I was like you know, it's Fall Break, which means it's a break, so you really should go travel and not supposed to be sitting there for four days and spending time there doing homework so um well I consider my time to be well spent in the month of October (laughs).

I: I do, too. Did you choose to do solo on this team?

S: No, no.

I: You got put in solo?

S: I'm very surprised. I didn't know why they, I don't know like they for certain assignments they asked us to write a paragraph like a hundred words to say you know do you prefer solo or pair, give your reason, and blah, blah, blah, and well I don't know which sentence I might wrote that indicated that I wanted to be on a solo team, but I didn't ask why, like, did they choose that randomly or depends on our answer, but…

I: I think it depended on the answer, don't you? (Kelli: I think it depended on the answers, but I think too that in order to round out groups she said she would randomly place them.) Yeah, because not enough people picked solo.

S: Yeah, exactly. I think, I think, that there's some like at least one person per team, uh, they're uh, they're picked randomly. So, I don't know if it's me, but…

I: So, you'd rather do the solo, I mean a pair, is that what you're saying, if you had your choice? You'd rather do pair programming?

S: Yeah, my, my answer to that question is like, I'd prefer to be a paired programming uh if I get good partner, but that really depends like…(laughs) So…

I: So what about your first assignment, did you get a good partner?

S: Um, well actually I think I ran into a problem a bit um we um we didn't, we didn't uh we completed the assignment, but our output is not complete correct, so in that sense it's not completed totally because it's um we completed the writing which is compiling and running and it prints out answers, but we were sitting in the lab um we ended up sitting in the lab and it's due at 11:45, we were doing the thing, testing it right up to that time so it's very, very, feel lot of pressure then, um, because we didn't get to meet that much in first week. That's, that's the main thing.

I: Is there any reason that happened?

S: Um, I, I think like at the beginning, we just, we just didn't realize timing, timing issue's that critical because it's a first, it's our first time for both of us to do pair programming and um, um like we were sort of tended, like, more like when we do the solo we were like, you know, both of us don't have time to meet today, we will meet tomorrow, or push it back to the day after, you know, like, still it's, it's only like from the first experience, then the second time they really put a lot into it, totally a hundred percent you know whenever you know we compared a time table like say any time that week that we could meet then we'll take that time. So, um…

I: So, even in your team approach, that's how it's gone too, right?

S: Yeah, like so far in our team, I mean, um, uh, we, we write email to each other every single day, like we have, I feel like we um, our team leader's good, he's very good, um, you know, everybody's, uh, you know, working towards the goal, um…

I: On the same page.

S: Yes, we are, we are, nobody's really not, you know, doing stuff, you know, we kind of, we're going at a really right pace, I feel. If we continue to do that I think we'll be able to finish the stuff a little bit earlier than the due date so we will be able to do attempt the, um, extra credit stuff, so…

I: So, tell me, um, you said you preferred paired, though, so why is that an effective instructional tool other than it makes you be a better time manager?

S: Um…what other benefits of pair programming you mean? Uh, well you really, you really would reevaluate yourself as your work approach as in your working style. How you interact with people at work especially like you know if you're doing some stuff on your own you can do whatever way you want, but in a pair programming situation you really have to respect the other person and always thinking about the other person, how they think, and always constantly consulting with each other and that's a totally different working style, a sort of like an approach, um, you really need to learn that in order to work well, um, so not communicating is definitely not good, while you wouldn't get any work done for pair programming if the two of you not meeting up often enough, um, so it's like even like you can email each other everyday, but then when you do, from my experience, I consider you really have to, if you really want to get full benefit from pair programming, you really have to get together two of, two persons sit beside each other doing stuff together as opposed to you know just meet up one time and decide, you know, break it up, I do this part, you do that part, and then we meet again tomorrow or the day after and then we see what we got and then go on from there I feel that approach wouldn't be, um, as effective as say, spending most of the time sitting together doing it.

I: What part do you think communicating with another person plays in learning about this, the content in this course? You know when you have it in a pair, you have to talk to the other person. What, is that helpful to you at all?

S: Um, yeah, definitely, because especially in a situation where you don't understand some stuff and then you can ask the other person, and the other person maybe say "Yeah, I understand it" or they say "No, I didn't understand it either" you know, then you like, you kind of, you kind of, you know, then you know for, if, if she didn't understand it (inaudible) then you know you're not the only person, somebody else is having the same problem so yeah I mean you got friends in class and you talk but in this situation it's like this person, I just met yesterday, he's having the same situation, so that's kind of you know um give you some assurance and so, you know, they, um also like if you're on your own and you have some problem like you don't understand you sort of tend not to ask people as opposed to two of you, none of you understand it, you're like, yeah we need to sort this out, we need to ask a person and then you don't feel any embarrassment you know if like you know I don't get this cause you know we both don't get this, so (inaudible) so and if we want to uh get the work done we ask like the TA or whatever you know like "Will you help us?" That's, that's, I feel you know that's, that's much better, like if I'm on my own I probably wouldn't, wouldn't do that that often, at least. Like, it's, it's kinda, you tend to be more open with the other person, where if you're, you know, working well together, then you tend to be really open, like, and you can learn a lot from that, cause other times you probably just (inaudible) yourself.

I: What do you mean by open?

S: Um…I mean, um, um, you really realize what kind of stuff you don't know and, um, you know, and, and, like if the other person knows that stuff and you don't know, uh, maybe like it's not because like the stuff is not, you haven't learned it before but you know he might have got from some other experience or internet or whatever, um, so you really, you kind of, you can see, you can compare with the other person and, and you know, um, if you don't know and you want to learn, um, this is a good time to learn, you know, you can, you can ask her how you do this stuff, you can see cause you are right there, you're right sitting there so you can see how the other person's doing it, so um and also in the pair programming, you are not just sitting there watching because I mean if you have and you don't get what she's doing you just ask, and she's supposed to explain everything cause that's the whole purpose, like, you, you, um…

I: Do you change roles?

S: Yes. Yes. Um, because, yeah, you, I think changing roles is necessary say, you know, planned off to do like I do this part and you do that part and but then in the process of doing it, it might end up like that person run into some problems that she you know don't know how do to that bit and then you find that like well I've done that before I can do that (inaudible) table or um and that way then she learns you know how you did it and or vice versa…

I: That's great. Yeah, you're giving us some great information. What do you see yourself doing after graduation?

S: Um, I, you mean as a career?

I: Yeah.

S: Um, well I hope I end up in software development where that's my main major area. Um, or um most of, like mostly we probably start with software testing, I'm doing one course in that as well, but I hope I really end up developing stuff, developing tools or whatever, software, um, myself, so…

I: Have you ever done that?

S: No. Like this is my first like software engineering course like teaching me how to develop, develop software as opposed to writing code, so um I like it.

I: You like it?

S: Yeah, and I really give a lot (inaudible) to my projects, so yeah, this is sort of my first big, big project and you know starting from the planning phase then…

I: You're excited about it?

S: Yeah, and so…

I: That's good. So, how do you envision this software developers' work? Do you know how they work, or do you imagine how they work?

S: In the real industry? Um, I don't know much about it. I'd love to know how they work right now, and since we got, we got so much problem when we were you know just trying to get this pair programming thing to work. Um, well from what Dr. Williams said, you know, a lot of them do, do take the pair programming approach um I, I think from what I know so far is, um, they're all, um, most of the software development is done very project-based you know it's, it's really broken up to different teams doing, uh, different project, and all, maybe all these projects, they're towards one big software package or something, so, so coordination is critical so I think that's where the pair programming thing came in…

I: So you think that what you're learning in the pair programming may actually exist in the developing workplace?

S: Yes, yes, definitely.

I: Um, thanks for your time, you've been very thoughtful and you've given us a lot of helpful information.

S: I'm glad.

I: Thanks very much.

S: Thank you.

Student: S_5

Interviewer: K. Slaten

I: What do you think of the assignments so far, that you've been given in class?

S: I think they're challenging, but they go on stuff that we've learned, so it's not, like, unjustified.

I: Okay, so, some of them were kind of difficult?

S: Uh, they're difficult, but it's not, it's not anything that we haven't learned. Or weren't supposed to learn.

I: Do you think any have been more, more difficult than the others or have they all been on about the same level?

S: I'd say, they've pretty much been about the same level, but the solo project we had, that had JUnit with it, it was just like another learning curve, but it wasn't any more difficult, though, it was just something new to learn, whereas, the other two were kinda rehashed (inaudible).

I: Oh really. Um, so thinking about the paired and the solo aspects of it, do you think that one was easier than the other as far as the paired issue goes, or the solo issue goes? Did one way make it easier?

S: Was is easier for the pair or did the pair make it easier?

I: Right, yes, did it make it easier?

S: I thought so.

I: Did you, when you were working with somebody else?

S: Um-mm, just cause it kinda made the, if there were, if there were any learning curves, it made it kinda lower since two people were there to bounce it off each other.

I: Good, um, what do you think about the other students in the lab, do you think they like the paired assignments, or do you think they'd rather have the solo assignments?

S: I, I'd say, that, uh, most of them like the paired. The few exceptions are the people that are really, really, really proficient at it. Uh, writing JAVA.

I: Oh, so if they're good at writing the code then they'd rather work alone.

S: Uh, I think so, yeah.

I: Um, what about you? What do you like better?

S: I think I like paired better. Just cause of the,…it makes it like, it's not, not as frantic to get it done. Because I know I had some other, uh, but if I can't figure something out you can just call somebody and ask them.

I: Okay, so you could get help from who you were working with? Do you find that that helps in the projects as being able to talk with each other?

S: Yeah, oh yeah, I think it, uh, it, it, uh, I wouldn't say my reading comprehension is great, so if there's someone else to read along with me, I'll just start drawing it out and he'll

get, he'll interject his, uh, what he saw differently than mine, so that probably cuts out like maybe an hour, or a half an hour, of having to go back and read the message board or the, uh, assignment again.

I: Okay, so, it, it saves you some time?

S: Yeah, I'd say so.

I: Can you think of any other reasons why, besides, you know, just being timesaving and having somebody there to kind of explain?

S: I guess somewhat less, like uh, a different standpoint, like helps you build relationships, I guess.

I: So there's that social aspect, is that what you're saying?

S: It keeps you being, like, a recluse. (inaudible)

I: Do you think, um, well, let me ask you this. What do you think it is about the paired assignments that makes it an effective instructional tool?

S: I think when you have two people there, you're less likely to uh, get stuck in a, in a certain state of mind where you're, where you're thinking about it the wrong way. Uh, that's helpful just overall. If you don't understand it this time, you get a better understanding of for it next time, instead of kinda just trying to scrap by. Then,uh, if you're doing it by yourself maybe, but that holds true for me, I don't know about everyone else though.

I: Well, I think it's a very good example because, um, I know when I've tried to go out and rehash ideas by myself without asking somebody, it takes a lot more time. Especially like you said, if you get started off on the wrong idea, you've got somebody to help you.

Um, have you notices any other approaches that help you learn in this kind of environment?

S: Uh, what do you mean by this kind of environment?

I: I mean like in the lab environment where there's the pair work going on?

S: What other techniques?

I: Mm-mm.

S: Um, if, it's easier, they say in the pair programming I think you're supposed to have like one pilot and one driver, er, er, I don't know what the names they use for them, but, uh, it's easier if you kind of switch off whenever instead of having it designated. I thought. Just because if, if you see something wrong it's, it's easier to say "hold on one second" instead of having… you can get aggravated like trying to point, or tell them to point to things on the screen and so, as opposed to just moving real fast by yourself.

I: So, when you're switching back and forth, that makes it a little bit easier?

S: That's if you're really impatient like I am.

I: Do you think, um, do you find that the different abilities play into that, when you're switching between the two, like if you're better at one aspect than your partner, or vice versa?

S: Yeah, I would imagine that it works out better like that. Uh, I would think. If he's more comfortable with the, uh, environment, it'd probably be better to hand it to him and stuff. I'm not sure. I would think so.

I: What about um, what about when you graduate. What do you think you're going to be doing then? Any ideas?

S: (Pauses) Um, I haven't really decided yet. Might go into some kind of graduate school, but not for computer science, hopefully. Four years of computers have kind of burnt me out. But, you know, I'm sure I'll get back into it eventually.

I: Do you think that you'll ever, um, do you see yourself ever working in the IT industry?

S: I already have.

I: Have you? What have you done?

S: Uh, worked for like a software development firm doing, um, like, backend, uh, database work.

I: Did you like that?

S: No. Not really at all, actually.

I: How long did you do that for?

S: Like 3 months, I think. Last summer.

I: Is that the only thing you've done out there in the IT world?

S: In the IT world? No, uh, I worked for like 3 years, or 2 years I did like, like network consulting. Like I would go and put in networks and advise them on what hardware to buy and stuff. That was, that was a little more fun, because uh, my boss was really nice, relaxed.

I: Do you think that this, um, the pair programming that gets used in the actual IT industry and software development, do you think that might help people, like you, who don't want to sit in that cubicle, where there's more of a social element to it?

S: Uh, that depends on how its, how well people take it, they actually do work or if they kind of, uh, I don't know. I imagine it would help a lot. I don't think it would help if you

started doing it earlier in like in the college career, you know, but I think it would help in industry a lot.

I: In the industry? Okay, do you think that if that kind of practice were more widespread in the IT industry, you would be more apt to go into doing that kind of work?

S: No.

I: No?

S: But, I mean, it would make it a lot…like, I just don't want to do it in general really. If I, if I were interested in it, I would definitely want to be pair programming and not the, uh, solo.

I: Well, I appreciate your time, you have given me some really good input and I appreciate it.

Student: S_6

Interviewer: K. Slaten

I: The first question I want to ask you has to do with the assignments that you guys have had in 326. What is your opinion of these assignments, how do you feel about these assignments?

S: I, the way I feel about the assignments is that they, they're not really applicable to the patterns discussed, like they kind of, like I understand that we're not going to be programming, you know, big graphical something, but I, I often, like, feel that the pattern is kind of being wedged into, uh, program where it doesn't fit.

I: So, are you saying that what you're doing in class and what you're doing on the assignments…

S: (interrupts) Well, I feel like the assignments are not good examples of the course material.

I: Okay, okay.

S: Whereas, it's like, it's like, um, (pauses), if in an classical English course they ask you to write a paper and it necessitated that you include 3 references to a video game character…you know, it's like, you know, you can do it, you can make a cohesive package, a well-written paper, but the pieces that you're putting in don't really fit within the framework of what you're doing.

I: Um, okay then, looking at the fact that some of them had been paired and then you've had that solo, you just had one solo assignment, right?

S: Yeah, we just had the one solo assignment.

I: What do you think about the difference between those 2? Does it still follow that framework that they're not really fitting cohesively?

S: Um, yeah, the, the problem with the cohesion is more the, the layout of the assignments as opposed to whether it's paired or unpaired.

I: Do you find either one is easier than the other, pair versus solo?

S: The paired, I find the paired easier when, when you get a good pairing. That's kind of the, the caveat and I don't know how many of these you've already done, but you probably got an impression some, some…like my first pairing I actually had 2, 2 teammates so we were a group of 3 cause the composition of the lab and I still ended up doing the whole thing by myself. (laughs) So, so like, I think kind of the flaw in using it

as a teaching practice is that unless you provide full time for the assignment, in class we can make sure, which is not feasible, then you, I know I'm not alone in doing it all by myself and I know there's other groups where they said "Okay, you write this part, I'll write this part, we'll mash 'em together" and a lot of times it didn't work, but that doesn't stop people from trying it.

I: Right, so do you find that one of the hindrances is actual, that you have to get together outside of class?

S: Yeah, that's, that's a major hindrance, and another problem is just people who aren't interested in the work or people who, like, it, it's difficult if you're at this level, you know, you, you've got a really good understanding and someone else isn't, like, I'd say that my most successful pairing, um, my partner wasn't very good at programming, but he knew more about JAVA than I did. So, whereas I was doing most of the planning the logic, he was saying " Well, there's something built in that you can use here" or cause, I, I learned, I learned in C++ and I just now coming back to the university, so it's kind of,… so, like, I know JAVA, but I'm not really comfortable in that realm, so he saying "Well you can use this, or you can try catch", which C++ doesn't have any of that, that mess. So it works really well if you're on a similar, you know, skill level or if one of, or if you have, you know, complimentary gaps in your, in your knowledge. So, I definitely have seen where, you know, cause that assignment came together so easily because I said, "Well, you know, we'll lay out the logic like this and we can shortcut it here and, you know, a simple little loop works to accomplish this part" and he would say "Well, this is how you do it in JAVA" or I would say, you know, "Does JAVA have this capability?", you know, "I could do this in C" or "I couldn't do this in C, but it seems like something

JAVA would have" so, whereas, I did, you know, I, we didn't switch off the whole pilot/navigator thing that much, so I was, I was pretty much the pilot, but he was a very solid navigator.

I: Okay, so do you think that if you had somebody who was like, where your skill levels were kind of the same, you think you'd do more of the switching?

S: Yeah. I think that if, that if, yeah cause I know that in, in, in times that I have worked with other people and, you know, rarely in programming with other projects that a lot of times, you know, one person'll start talking and the other person'll start writing and then, you know, the other person starts talking and the next person is writing, whatever, to kind of switch up. So I definitely see the potential with people of similar skill to do that kind of thing. So I, I see, I see the potential in the practice, I think that it has difficulty in application and, uh, teaching.

I: Yeah, that can be an issue and that's why we're trying to kind of evaluate what's going on. Um, what do you think about the other students in your lab? Do you think that they like the paired assignments better than the solo assignments?

S: Um, I know that everyone, that the majority of people given an option tried to get into a pair, but I think, I think some of that is people trying to look for someone to make up for their deficiencies and lack of work and in my case, I was looking to kind of keep an eye on someone to make sure that they weren't, you know, making a mess of things. So, so I do know that, that there is some animosity towards the practice just cause you get paired with idiots sometimes or you get some…or you expect them to do some work and they don't. So, I've heard a certain amount of frustration there, um, and so again, I think, I think it's kind of hard to kind of judge because everyone's, you know, there's a bunch of

loud people yelling about it and there's a bunch of people asking to be put in pairs, and I'm not sure if given, given an ideal configuration I think that a lot more people would…cause, cause I, I do know that there are people who see the value in pair programming, but just with the people we get paired with, it…

I: Well, and I guess that's kind of the, uh, chance you take when you do these. Um, now from what I understood, the first assignment, you guys were paired based on personality types, on the Myers-Briggs…

S: They've not given us any kind of clear indication of how we're paired. They, I, you know, we did give them the Myers-Brigg, it was the only real data they had on us. And, I guess, you know, or, or, like we didn't have any real academic…you know, we really hadn't shown anything prior to that and so I know that they've been experimenting with different methods of pairing, but that's kind of a black box for us. We just get out the pairs.

I: Okay, here's your partner, have at it. What about the team project you guys have just started, are you in a paired team or a solo team?

S: I'm in a paired team, but we're short a partner.

I: Really?

S: Like, that, he, he didn't actually drop the lab, but he didn't show up for the lab previews and the lab where we were given our pairs. So, it's, it's a pairing, but I, I imagine that with a three person group that a lot of work is going to have to be done solo. So…

I: Or like your first pair, where you actually (inaudible). Is that what you asked for? Did you ask for a pair?

S: I, I asked for a paired.

I: So, you actually got what it was you had requested. I don't think that happened with everybody.

S: Yeah, I, I know, I think everybody, uh, everyone I talked to requested a paired. And everyone they talked to requested a paired. And of course, I, I don't know exact numbers but I gather that approximately half of us got pairs.

I: It seems like over half of you were in pairs, but I know that there were a lot of people who requested pairs, but got put into a solo group.

S: Some people, like one person said to me, they said, "Oh they put the people that weren't doing so well into pairs… except for you" (laughs) I don't know if they (inaudible) anyone in that group. So…so there's a lot of guess work as to how the pairings are done and who gets put into what groups, but, but like I said they don't tell us anything.

I: I'm not sure how those were done, I just have the end results, I have the list, that's about all I know. Um, what about when you graduate? What do you think you'll be doing then? What do you want to do after graduation?

S: Um, as like paired or solo?

I: Or just in general. What do you want to do for a real job?

S: Um, some kind of coding. I have some friends working at SAS now that I talk to. And they seem, they seem to like SAS cause, like, SAS has really does have good, like, personal perks, everyone knows that. You, you wash dishes, you get good perks at SAS. So, uh… so that's kind of like my dream job that I aspire to. We'll see how that works, but, um, and I know, like I, I talked with them, they don't do pair programming, they mostly do something that breaks into pieces and each person takes it…and, but I again, pair programming is relatively recent and, so, like, the people I was talking to said,

"What? What's pair programming? What's that?" So my friends, you know, working at SAS, don't really know what it is, so, it, I don't if, they might, at some point they might have some little pod somewhere that's doing…

I: Do you think it would make a difference on the job, if people were put into paired programming situations?

S: I think, you know, say the same things as you see here, is that if someone, like, I, I definitely think that if, that, it would help to have some kind of a new person, kind of paired with an older person, to get kind of a sense for how things are done around here, how things, you know, so like, the new person you know, have all the, you know, kind of like my second pairing, where kind of the other person has this drive, this interest and this desire to learn, and the old person is kind of like, you know "Here's what we've been doing, and this is how we expect your code to look" and uh, the other person would be like "Well, there's this practice out here, can we, you know, insert this or (inaudible) this, or why have you been doing it this way? This way's so much better", and so I see, I see that potential right off because, you know, for me working with someone who knew, you know, some of the technical details, you know, whereas I felt confident in my general knowledge, that that worked out well. So I see definitely a potential at the entry level and also higher up, again, if you have two people of comparable skill levels, I think that, that the two, the two people can, you know, cause in, I'm right, right now preparing for the ACM programming competition and so for that a lot of times, you know, we are in groups and we'll get something together and we're solving a problem, something like, well…you know, you can use brute force it you got this many combinations and you're looking at it this way and somebody else could look at it this way, or, or like, I'll solve a

problem recursively which, which very quickly becomes, you know, a million possibilities and, you know, times out the process, er…and someone else will say "Well, you know, you could solve the simple version here and use that as a bound for your other thing" and that's uh, you know, so, when different people come together with half a solution, then you come with, you know…

I: So, there's like that collaboration.

S: Yeah, like, there's, I mean, it's, it's definitely true that when you work together with somebody, you have fewer errors and better work.

I: It sounds like it's a little bit easier than trying to hash it out yourself.

S: The place where pair programming fails is where one person knows everything and the other person isn't contributing. So, if you, if, if the second person doesn't know, you know, doesn't know the language, or doesn't know, you know, the patterns, doesn't know, anything, then we have, we have a different amount of work that is more than, you know, one person, probably for two people together you probably expect, you know, about one and a half times what, you know, a solo person could do on their own. Just like, it's my personal estimate…

I: Right, there's different abilities.

S: So, so, if you have, it's, it's kind of like, um…the argument against communism, cause it's kinda of like, not so much that you're, it's that when you're, when everybody's working together you just kind of end up some kind of mediocre average, as opposed to…which is, which is what I felt my first group, was that, like, I was hauling them and so what we ended up with was not…so, so I think, that for like, for like professional applications that it matters who's paired with who, and, and in that, probably the way to

catch that is to have, you know, reviews of each person after the project to be like, "Yeah, he didn't actually do any work".

I: Do you do that in class? Do you do reviews?

S: We do submit a kind of review, but the review submission tool is so sloppy that I, I don't know how much they've actually looked at that. I know I gave my first pairing a very lousy rating and I didn't hear any questions as to, you know, why. I think his score came out to be, like, 45 out of 100, like, when you added the numbers, so, um, I, I…they never questioned me as to why I would give him such a low rating, which, which suggests to me that they're not following it very closely. I know one of the TAs personally and he says that it's really hard to pull any data out of that, so…our final project should be to rewrite that. (laughs) But, uh, yeah, so…

I: Have you ever worked in the IT industry before?

S: No. My, my, well, yes and no. My, my one, I did do a little contract programming for a company, but they pretty much, I, I communicated through a student and he said "Okay, we need you to write, you know, take this kind of input, (inaudible) this kind of result, you know, let us know when you're finished". So, so it was, it was more of the style than any kind of programming assignment rather than…So, I'll, I got paid for it, but it didn't feel like real world, you know.

I: Anything else you can think of that you want to add?

S: No, I think that pretty much covers it.

Student: S_3

Interviewer: K. Slaten

I: Thinking back before the project, the team project, how did you feel about the assignments that you were given?

S: Um, just in general how did I feel?

I: Yeah.

S: I felt like they were really challenging, I had been feeling like they were too much work for the amount of time we were given and for just one or two people. So, (inaudible) but I thought they were really interesting programs to do, uh, it was just difficult to do them in the amount of time given with having other classes and stuff.

I: Exactly. Even when you had paired, even when you had two people working on it, it still took a lot of time?

S: Yeah, well the first pair I had didn't work out, so I had to do it myself, so that was um kind of difficult but um they adjusted the assignment for me a little bit so that helped out and then the second time you know we had a pair and um we still worked a lot of hours in our pair to try to get it done.

I: So what about that first and second assignment? What happened with the first that you ended up doing all the work?

S: Um, my partner decided to drop the class and it's kind of a weird situation because she was going on vacation the week before when we were supposed to be working on it. She said "I'm sorry we can't even get together because I'm going to be on vacation and so we're just going to have to work separate and then put our parts together". So, she divided up our work and then, the day we were supposed to come back and put them together, like, two days before it was due, in the lab, she sent me an email, and I got in the lab when I was waiting for her that was like "I didn't do any of my part when I was

on vacation, so I'm dropping". So that wasn't the best, that gave me a little bit of a not so good view of the pair programming just because my partner ditched on me, but, um, the second time with pair programming worked better.

I: That worked okay then? So, did you have to spend a lot of time together out of class working on it?

S: Yeah, we met at the, um, we met at the lab, like, every other day or something during the course of the assignment.

I: What about, uh, the solo assignment?

S: Um, the solo assignment was really hard and I didn't, I was one of the ones who didn't finish all of it, like I almost completely implemented the program and didn't get the testing done. That was pretty hard. I started on the testing, but, um, it was hard for me to pick up on it and so, um, not of it was working and, so then I was like okay I'm going to rush at the end here, I'm going to go back and finish up the program which maybe wasn't the best choice to make, but, yeah, I didn't finish that, it was pretty hard.

I: I've heard it was a difficult assignment. How about what you've done, um, let me rephrase that…How do the assignments relate to what you've done in class?

S: I think they relate really well as far as when we learn the pattern in class and then we have to use the pattern in our program and we learn do to the different URL diagrams and stuff and then we did that actually for the assignments, so I think it directly related.

I: Let's get back to this idea of the pair and the solo, um, and the differences in these. First of all, what do you think the other students in the lab feel about the difference between the two?

S: Um, I think for the most part people enjoy pair programming and think that it is more effective um some people have complaints about it um because it's hard when you're in all these other classes and we're juniors and seniors that have jobs, um, it's hard to always get together and actually sit side-by-side for hours and program. Um, but I think that from what I've heard others talking about and my own experience, that most of the people, um, wished that that last assignment wasn't solo um cause they thought that the pair programming worked better.

I: Outside of being a time issue with meeting together, why do you think more students like the paired?

S: Um, I think that it's very common thing to get sort of stumped on something or code something that you just um look back at and can't figure out why it's not working and I think that pair programming really helps solve those issues cause you have one other person there looking with you and they can quickly see what you are blind to for whatever reason.

I: So, that way it's easier to find the mistakes that you have going on there, as opposed to working by yourself?

S: Right.

I: Um, what about you, what do you think about the difference between the two?

S: Um, I think sort of the same thing I just described. I'm always running into problems where I get stumped and when I try to debug my own code, I have the hardest time um figuring out why what I did is not perfect, so, um, it's a lot easier to have somebody there. I also um took a break from school and did some co-op and stuff and so um it's actually been about a year before this class before I had done JAVA programming and I

was not so fresh on it, and so the pair programming really helped me because I would sit there and I would go "Now there's a method and it's something you can token on strings" and then they would go "Oh yeah, there's a string tokenizer" and I'd just type it in you know it was a lot easier. I didn't have to go just searching through the APIs for hours.

I: It takes a long time to look stuff up, doesn't it?

S: Yeah, so, and, and I even remembered stuff that you know my partner wouldn't remember, too. He would be like "I think there's a way we can do this" and then I would think of a method I've used. Cause everybody's done different programs before in their classes and have a different background of what they've used in JAVA.

I: Um, what do you think makes a good pairing?

S: Um…

I: I mean what qualities in the pairing make it work, make it mesh?

S: Um, well I was thinking about the like Myers-Briggs stuff, and I'm not really sure if that, I don't know what you guys see in the um, if you look at how that works out and how people are happy with being matched via that method, but uh I don't really think that, that is that important, whether you're an introvert or an extrovert, or whether you are all about organization or not and stuff like that. I think it's more that if you're schedules work and if your, if your caliber of programming skill is, um, close to the same, not, not necessarily exactly the same but if it's around the same level because otherwise you have one person that's just like doing everything really fast cause they know how to do the program in 5 minutes and the other person is not really taking it all in and participating that much. And, I was paired with somebody who really was very close to my caliber of a programmer and, um, had some background in classes and stuff and we really worked

well together in the pair. Um, really just kind of half and half going into the program and working on it.

I: What about, um, looking at this as an instructional strategy, putting you guys into pairs and doing assignments, what about the pair programming do you think makes it an effective instructional tool?

S: Um, I think that if holds people more accountable. It makes people not do as much work at the very last minute, um, since they have to schedule with their partner and they just are better about planning it and working on it and I think overall they, um, take more time to do it right.

I: So, it makes you more responsible?

S: Mm-mm.

I: Maybe a little bit better at time management?

S: Yeah, and also you don't get stuck on something that inhibits you from completing everything in the assignment if you get stumped for a while on something and it might take up too much time and then you don't get done, it's better if you have somebody working with you that can help you with that so you guys can move on and you can actually get the full assignment.

I: So you can kind of talk it out, between the two of you?

S: Mm-mm.

I: What about graduation? When you graduate, what do you think you want to do afterwards?

S: Um, I think I'd like to do some kind of um programming or networking and, uh, from my experiences in this class I would say that I would love to be part of some kind of

programming team where we were able to kind of feed off each other and work closely together um rather than just being like locked off in an office by yourself for a month or something. I'd like to work close net with other programmers and I think it would be a lot more effective.

I: Do you think it's more effective overall when programming is done that way, instead of just sending everybody off on their own. From what I understand historically, that's kind of how it's been done, I'm not a programmer, so I don't know much about it.

S: Oh, I'm actually in a solo group, um, and, and the solo group, since we're not doing it in the pairs we actually have been dividing a lot of it up and we end up having to um change a lot of stuff to put it all back together so it's really a lot harder, I think, than if we were all kind of…

I: Did you ask to be solo?

S: I did ask to be solo um cause my first experience made me nervous about the pair thing, about getting somebody else who maybe just wasn't going to work on it or was going to tell me we were going to meet and not or something like that and I just thought "Why don't I just sign up for a solo so that I can have, like several other people". I didn't know how it was going to work and I thought with the pair thing that it might be like you know this pair works on this and this pair works on this and then if my partner didn't come through then I was going to have to do it all myself, but I thought with the solo since it was more like four or five people dividing it that I could call on different people to help me or something. I guess I probably could have done that in a pair, but I requested solo for that reason.

I: So, is it working out okay?

S: It's working out okay, but it is a lot of work to uh put it back together. I wish we were doing more work collaboratively.

I: When you guys get together, do you end up rehashing out the problems that you've been facing, like when you go off and you're doing your work by yourself and then when you come together, are you able then to feed off of each other and get answers?

S: Yeah, that's exactly what we do. So, we run into problems and then we come together and say "I've been having a problem with this and I can't figure it out" and probably everybody spent too long trying to figure it out on their own and then we get together and somebody else in the group can help out.

I: Have you done anything along these lines out in the real world?

S: Um, not really, I, I had a job at Cisco and I was doing like networking stuff more than programming and I was kind of on my own and well, I guess, for that reason I know that I was on my own and I would have worked better if somebody else was working with me cause I would get stumped on some of that stuff as well, and uh just get stuck and then uh the next day or something I would be able to contact somebody who I knew knew something about it and so…you know, I think that the collaboration is something that I'll be looking for in the workplace.

I: Did you like doing the networking?

S: Um, I really did.

I: Do you like it better than the programming?

S: Well, it's kind of weird because you do um when you do all the configurations on the network it's almost like it's own sort of programming like you have to know the language to type in all the codes and stuff so um I kind of felt like I got a little bit of um of the

programming that I like, but it was also combined with uh hardware. So I felt like it was kind of a neat combination cause I like hardware, too.

I: Do you think that the, uh, the pair programming is going to be more of a practice that's used in the IT industry?

S: I think it would be good if it was. I know that people um in the industry seem to um from what I've seen at work, seem to be resistant to a lot of change and um and there might be a lot of people who want to keep doing it the same old way and locking themselves in a room um but I do think that um places that are willing to try it out will definitely accept it and start using it.

I: Do you think that a company could to both?

S: Yeah. Yeah, I think that would work.

I: I think that's about it. I appreciate your time.

Student: S_7

Interviewer: Kelli Slaten

I: Think back before the project, and those assignments. How did you feel about those assignments?

S: I felt they really broadened my horizons and far as programming is concerned because, again, I've never done anything like that in my previous courses, as far as the types of programs, abstract factory, and stuff like that. As far as the pair programming aspect of it, I think it's very good, but yet inside of this college setting, it's probably not the best because everyone has different schedules and you know some people work 20 hours a week on another job and so you can't really meet with them all the time. And so,

therefore, in some ways um being in a paired group can be slower than if you solo, because you can't work when you have you know a two hour break or you have to wait until 7:30 instead of working at 4:30 to, before you can work on the project, but by the same token, working in paired, in a paired situation you can learn a whole lot more. For instance, I was with a group member who was really a C++ programmer, but yet his logic was um above my own. So I knew the JAVA and he had the really good logic and so we put those together. He did most of the driving and I did mainly like the navigating and I would, I would let him first put down his ideas on screen and then I would tell him "Okay, well this is what you need to do to make the syntax correct". And the way he did it, we came out with really elegant code and it was more advanced and more efficient than anything I could have made you know on my own. So I got to see another way of doing, you know, something. So it really, that was a good experience so again, that's because I had a good partner. Now again, you know, it's a two-edged sword when you come to pair programming you can have a partner that you know if the partner is um less skilled than you and doesn't know the language then there's really no benefit it's probably, you'd actually be benefited if you were solo in that, in a situation like that.

I: Because your skills are so far…

S: Yeah, yeah, when one is um because it boils down to the point of the person who knows the most is going to be the one who does the coding. I mean, if you don't know then why get in there and mess up something that's already working, so, you know…

I: So other than time management issues and the different skill levels, does that seem to be the only thing that's a problem in the pair programming?

S: Um, I wouldn't say that's not, that's not the only thing. Just being able to work with other people is well, that's something that, again, in this college setting, that's a gray thing, because everyone up until this point is used to things being their way, you know, they only choose the group members they want, I mean, that's nine times out of ten, they choose only the group members. I like how it's randomized I think it should always be, stay randomized. Because, again, when you get out into the work, you know, into the industry, it's not going to be that way you're not going to be able to choose who you want to work with just because you know you went to go eat at you know…Ryan's last week or something. You may be paired with your worst enemy and I've been paired with, um, with a person who, it wasn't, it worked out fine, but if we had to choose on our own, I don't think we would have chosen each other but yet we were still able to work, to function as a group or function as a pair and still get the work done even though our personalities really didn't mesh we didn't have any conflicts, there were no arguments nothing like that, but you know, sometimes there were little periods of awkwardness whereas he didn't say anything, I didn't say anything and, and it's just we were just working, but then again, that's how it could be in the industry, so I think, I think it's really good that it's randomized. I think if for some people that may be what they take from this class, that may be the greatest thing that they take from this class, is, working with someone that you probably don't get along with you know, having to work with them and still having to produce quality um software as opposed to … Yeah and sometimes that's the most valuable lesson I mean who cares if you can, if you're the best programmer in the world, if you can't work with person x, y, z, then you know what good is that. I think team, um, being cooperative in a team or in a group is really a very handy

skill that is subconsciously learned in this you know and this programming environment fosters that, so I think that pair programming, um I think that's the one up, uh, why, um, it's just better than solo programming, you know, just for that aspect because there's no other, you're not really going to learn that in any other class, not too many other classes force you to you know…

I: That's true. And a lot of other classes seem to let you pick your group, or they group you by topic. When you say "choose randomly", do you mean get rid of the personality testing? I know in the beginning, the Myers-Briggs test was used to help them pair based on personality type.

S: Well, I know that um…well they did give the option of like, for instance, you can list four people who you didn't want to work with and, again, I don't know anyone in my lab group and I could put down four people who I think I wouldn't want to work with, but again, I don't know them well enough to know, I mean I may be cutting myself out of having a great partner, so I didn't put down anyone. So I left it that whoever I got was whoever I was going to work with um for instance, one of my good friend's project, my um group member who I was thinking about who the one who I didn't you know our personalities didn't necessarily mesh very well I was thinking about putting him down for okay, I don't want to work with him but then I was thinking, I may get someone worse you know I mean he a least…

I: That's always a possibility.

S: There's always a possibility, I mean, he at least, I've worked with him, I know that when we have a team meeting say and we're going to meet at two o'clock, he's there at two o'clock, he's very punctual, um, he, he's not one who looses his cool or gets really angry,

um, I mean he does put forth the effort, he doesn't slack off I mean that right there, so what if there's awkward silences I mean at least he's one that you can work with so I said I have not reason to discount him so um in, in the lab just last night, we saw other group members or other groups from um other lab sections and you know there's this guy who's just playing the heavy and really just you know just kind of blowing up at his team members and everything, I was just so thankful that I didn't have anyone like that in my group. So, as far as the personality thing, um that can help in some scenarios, I think overall it depends on how much the person is willing to do whatever's necessary to you know for the sake of the group, I think that's what it boils down to, I don't know how you could really test that um you can't really test that, cause I know, I know that it's, I've heard that with that um personality test, they tried to match up the leaders with the followers, um that's what I've heard. Again, I don't, I don't know, but that's just what someone else told me that was just another member of the class. Um again I was thinking what if you had five leaders you know in a group, would that work out? And I would say it depends you know because if, if all the leaders say "Okay, we're going to choose just one and all the rest of us will follow" then it would still work but yet if you have everyone in there saying "No, I want to be the leader…no, I want to be the leader" then it won't work. But, as long as they all come in there with the mind set of saying we're going to do what's best for the group not what's individually in our interest, but what's the group interest, I think it would work out. And how can you, again, given that you can't really test for that, I don't know if this, if the, um, Briggs personality test really affects, has that much of a positive affect. Um, not to say that it has a negative affect, but I don't know if it really benefits that much.

I: You're saying it may not be, um, something that tells you if people are actually going to get along?

S: Yeah.

I: Where you said that you had a partner, where your personalities clashed a little, but he always showed up, I think that's very important as opposed to getting a partner who you get along great with but who never shows up.

S: Exactly. Or, or one, and even to a certain extent I think it's an, a, a benefit that you are partnered with someone that you don't know all that well because then there's a pressure to always put your best foot forward. You know, you're working a little bit harder because this person, you're giving off an impression to this person so you want it to be good, but if it's one of your friends, you know, you go out and play basketball, "Oh, we'll put it off until next week" you know, "I don't feel like doing it right now" and the other guy, he's not going to give you a hard time about it, so you actually get less work done with, with your friends as opposed to, you know, unless you have really strong work ethics but just like today in the projects, um, like a lot of groups, when they ran their code, well, I won't say a lot of groups, but when a couple of them ran their code, it wasn't, it didn't even run, it wasn't functional and again it's not like that they didn't have enough time, it's just they slacked off, you know, on some things and um I think that's you know, that's probably has something to do with it as well, if you're comfortable, if you're not as comfortable with your group members then your more, nine times out of ten more liable to work harder then if you don't know them.

I: Are you in a solo or a pair team?

S: I'm in solo.

I: Is that what you asked for?

S: I didn't ask, um, I can't remember, um, to be honest, I can't remember what I asked for. I was of the mind set, that,…I can't remember to be honest with you, but I do remember when I was writing it, I said I don't want to constrain myself because again I don't know who I'm going to get so I'll just, you know, either one was fine. Keep it random.

I: When you graduate, what do you think you want to do?

S: (pauses) I don't know. I really don't know. Because I know that when I graduate my most valuable skill will not be the algorithms, or that I learned just how to get along with people, I know that takes you a lot further than, than, you know, being able to get along, communicate, and write well, those three skills will take you much further than you know than how much actual knowledge, actual knowledge you know. So, I'm really relying on that and so, that's why I haven't really narrowed it down to "Okay, I'm going to do this or bust", um, I mean I can, I feel like I'm the type of person that can work well in almost any situation you know, cause I try to be as flexible as I can, I try not to be closed minded and limit myself to only you know just one scenario, cause, if you don't get that scenario then what do you do? I try to go with it…

I: You're going to be a very valuable employee whatever you do. Do you think you want to stay in the computer field?

S: Um, I was thinking, I have the interest in many things actually, computers you know, and business, also in the marketing area of business, um, I was thinking it'll probably filter down to either computers or business, somewhere in between there, I know, and those are two very versatile fields, I mean, they're everywhere, so the possibilities are endless.

I: Yes, they are. Do you think that um if you were to go into the IT field, do you think that pair programming is going to benefit the IT industry?

S: Just to be sure we're on the same page, when you mentioned, when you say IT, what do you, cause,…

I: You're right, let me be more specific. As far as the software programming goes, people who do programming have, historically, been shoved into little corners, hashing out code. Do you think that with the implementation of pair programming and maybe bringing more of that aspect into the workplace, do you think things would run more efficiently or better in some way?

S: Uh, for pair programming, I'm not so quick to say it would run better. In some scenarios. I think there needs to be a hybrid. I think that's an excellent way to train, a, you know, weaker programmer into being a stronger programmer, pair them up with someone better than themselves, let him see how things get done and then he can, when he goes on solo, he can take what he's learned from that experience, and it makes him a stronger…I think pair programming's excellent for training. As far as just straight out production, "we need to roll this off by November" um I think solo actually has the hands up because you get, you get more work done quicker when you have you know five individuals working with five programs as opposed to just five working on two or three programs you know.

I: Are you saying this as if they were capable programmers as opposed to somebody new coming in?

S: Yeah, if there's someone new, then I'd say pair them up, but um if they're all highly skilled, solo.

I: Do you have any questions for me?

S: No.

Appendix B:

Lab Observation Notes with Assignment Descriptions

CSC326 LAB OBSERVATION LOG

09/03/03-09/04/03

Lab 201-Lab began with a 30-minute group project:
CRC Cards (30 minutes)

> Divide up into groups of four or five, and acquire a bunch of index cards for the group. The requirements for the CRC card exercise are below:

In this CRC card exercise, you will model an alarm clock working. Your alarm clock must:

1. 1. Allow a user to set the time.
2. 2. Advance the time, one second at a time.
3. 3. Display the correct time unless the “alarm” button is pushed. When the alarm button is released, the time is displayed again. The user can select whether standard for military time is displayed.
4. 4. Allow a user to set the alarm time.
5. 5. Allow a user to set the alarm so it sounds at the appropriate time. Allow the user to unset the alarm so it will not sound.
6. 6. Allow a user to push a snooze alarm so the alarm re-sounds in 10 minutes.

> Begin by dividing the problem up into a few obvious components (remember, identify the nouns). Write the name of each component at the top of a card, and assign each person to play the role on a particular card.
>
> Now, you play a "what-if?" game. Run through the required use cases of the system you're trying to design, and for each one, work through what each class must do to perform that use case, and what other objects it must collaborate with. Record these responsibilities and collaborators on the card.
>
> When you think that a class is taking on too many responsibilities, try to factor out some of that responsibility into another class. Create a new card, assign it to someone, and see how things flow with that new card in the mix.

The groups are labeled on a diagram of the lab. Group Notes: G1: had one dominant member and one member who seemed to be working by himself. G2, G3: members talked and worked together (G3 had all guys). G4: very talkative with each other.

Next, students paired up with their HW2 partners (they were paired based on personality test: Myers-Briggs) and worked on a tutorial about Class Diagrams. They then worked on HW2 assignment-Abstract Factory.

Pie-Throwing Simulator Requirements Specification

Disney is releasing a new children’s game for the computer in which Heroes and Villains engage in a pie-throwing contest. A preliminary set of rules that will govern the game has already been written and will be provided to you. As a part of project analysis, you are to design a simulator that will run several pie-throwing contests based on the current set of

rules. Your simulator must read in character attributes from an input file, correctly compute the results of the contests, and display the output.
Pairs are labeled on a diagram of the lab. Pair Notes: Pairs 1,6,8,9: not a lot of collaboration, seem to be working more as individuals. Pairs 10,11: collaborated in and out of their respective pairs. Pairs 2,3,7: collaborated and talked together the entire lab (2 and 3 were the most talkative). Pairs 4,5: worked together, but did not talk very much.

All pairs except #8 asked each other questions and discussed what was needed.

Lab 202-same assignments as above

Group Notes: G1, G5: lots of collaboration and talking, looked very relaxed working together. G2: did not tape-student who does not want to be taped, was not a lot of interaction. G3: very confident group, little collaboration. G4: slow getting started, a lot of collaboration once they got going.

Pair Notes: Pairs 3,8,9 did not talk very much. Pairs 11,12 collaborated as one large group. The other pairs all talked with each other through the problem and collaborated together.

Lab 204-same assignments as above

Group Notes: This is a very quiet lab. Every group was slow to get started. G4: quiet and attentive, split into 2 smaller groups. G5: one dominant member, 2 of the students talked a lot together while the other 3 watched and wrote.

Pairs Notes: Lab remained very hushed and quiet. Every pair talked together, but very little.

Lab 205-same assignments as above

Group Notes: G1: serious workers in this group, but collaborated together. G2: this group had a lot of fun working with each other, very relaxed. G3: slow to talk to each other, began working together 15 min. into project. G4: interacted very quietly, finished early and went to work in pairs.

Pair Notes: All collaborated, one guy helped several other pairs.

Next week: same pairs, not taped
Next week: Hurricane Isabel, not taped

09/24/03-09/25/03

Lab 201-only assignments were the class diagrams and JUnit tutorial. HW4 was solo, so students were free to leave when finished with the tutorial. The assignment was not paired, but students were allowed to talk with each other. HW3 pairs worked on the J Unit tutorial (this information is according to the web page, in reality, the partners were self-chosen).

Class Diagrams

Create the class diagram (including relationships and multiplicity) for the following Course Management System:

> There are two kinds of courses, undergraduate courses and graduate courses. All courses are made up of topics. Teachers teach all courses but undergraduate courses also have a teaching assistant. Course administrators mange the assignment of the courses to teachers and teaching assistants. A course schedule is created for all the courses. Students view the course schedule when they decide what courses they wish to sign up for.

Notes: The girls in this class paired with each other. Half of the class was very quiet while the other half was very talkative.

Lab 202-same assignment as above, except the TA told them to individually (problem: not enough computers for individual work).

Notes: Lab was much more quiet than 201, but the talking did increase as time went on. The girls in this lab did not pair with each other, instead they each paired with a male student. Most students left when they finished the lab.

Lab 204-same assignment as above, except had to do 2 tutorials (5 and 6). Therefore, the students worked with their HW3 partners.

Notes: Only 2 girls in lab. Every pair worked together, but there was no collaboration between the pairs. Very quiet lab. Was told halfway through lab that James did not want to be taped.

Lab 205-same as 204

Notes: This is a very relaxed lab. The entire class talks and laughs. More interaction among the pairs.

10/01/03

Lab 201-only had a 60-minute tutorial and case diagram; students could leave afterward since still working on individual HW4.

> With your any classmate, go to http://courses.ncsu.edu:8020/csc326/lec/001/tutorials/ and do the use case tutorial.

Now, create a use case diagram for the following requirement. Use <<includes>> and <<extends>> as appropriate.

1. 1. Patients can make and cancel appointments, request medication and pay bills.
2. 2. Schedulers actually make and cancel the appointments (as requested by the patients). In order to make or cancel an appointment, the scheduler must check patient records and ensure an appointment (day/time) is available.
3. 3. Accounts receivable works with customers to pay bills. They check the patient records to determine the outstanding balance and to update the outstanding balance once the bill is paid.
4. 4. Doctors actually request the medication (per customer request) but must also check patient records before doing so.

Print this out and turn it in to your TA to get credit for the lab today.

Notes: Half the class was quiet, other half was quite talkative. A few pairs did not talk very much.

Lab 202-Given notice one of the girls does not want to be taped. Not a lot of interaction among pairs.

Lab 204-I accidentally messed up the tape.
Lab 205-only a handful of students who worked about 15 minutes and left.

10/15/03-10/16/03

Lab 201-The first activity was a 60-minute group project:

Introduction

In Extreme Programming (XP), one of the key elements is planning. Planning involves both discovering what the customer wants and estimating how long this will take to do.

Customers divide up the work to be done into a set of stories, each of which can be written on a 3 by 5 card in a few sentences. The developers then estimate how much effort is required to build each story. The customer then chooses which stories she wants built in the next cycle, based on the time available and the estimates from the developers. This is a brief outline of the Planning Game.

Set Up

Divide up your group of students into teams of about 6 people. Two of these are to be *customers* and they should sit where they can talk. One of the students is a *monitor,* and they are to keep everyone honest. They make sure there is no coercion in the estimates or in the requirements, for example, and they judge whether the rest of the students in the team (the developers) have actually built what the customers want. One student is the *tester*. About Four students are the *developers* on each team.

The instructor needs to provide a place for each team to work, though this may just be a corner of the classroom. The instructor also provides about 20 or so 3 by 5 cards to each team. Each team will need at least one watch that tracks seconds. Even better, but not necessary, is a stopwatch.

The Task

Customers, of course, specify things and write “test cases”, and developers build them. The tester makes sure the developers built something the customer wants (aka, they pass the customer’s test cases.) The idea here is to "build" a coffee maker to the specification of the customers, where "build" here means that the developers will *draw a picture of the desired machine incrementally*. The task will be carried out in two cycles, each with two parts. The first cycle is a bit different from the second. While the teams are working the lab instructor may be called upon to answer questions about the process.

The class was divided into 3 groups by the TA (all 4 female students were in one group). All three groups collaborated, laughed, and seemed to have a good time with the activity.

The next assignment was a configuration management tutorial:

Configuration Management (20 minutes)

Do the tutorial Configuration Management found in the Eclipse book, Chapter 31. Your TA will provide you information to use when setting up your repository on p. 718. For those of you who don’t have the Eclipse book (for shame!), your TA will have copies of the tutorial for you to BORROW while you are in lab. These copies will be kept on the TA table (along with some copies of Chapter 5). Please use these while you are in lab and do not take them out of the lab.

If the tutorial takes longer than 20 minutes, stop after 20 minutes so you can have a 30-minute team meeting.

The last part of the class was used for the first team meeting.

Lab 202-Taping of this section has been abandoned due to student protest.

Lab 203-Same assignments as above.

For the first activity, students were divided up into 3 groups by the TA. This section is more quiet and subdued than 201.

Lab 204-Same assignments as above.

There was a lot of wasted time getting the groups decided upon. The TA then had the students get into their teams to do the tutorial and then work on the team project.