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ABSTRACT

Through interviews and classroom observations, this study investigated the academic help-seeking and interactions of high school girls with their computer science classmates in both a private school and a public school setting. The study explored five aspects of this help-seeking interaction: (1) females as a gender minority in computer science; (2) determinants of peer interaction; (3) teacher versus peer assistance; (4) factors detracting from willingness to assist peers; and (5) preference for group interaction. A key finding was that physical proximity was an important determinant of help-seeking behaviors in a high school computer lab. Another finding was that girls in the sample often asked their peers for help even when they preferred the teacher's help and believed that the teacher was more knowledgeable. One counter-intuitive finding was that most girls preferred to work individually in a setting in which there was already substantial peer interaction. One implication of this study is that teachers should be wary of applying the general finding that girls prefer group work to every girl in the class and should instead respect the preference of the individual. If the findings are found in other settings, then a recommendation might be that in order to maximize help-seeking, talented programming students should be evenly distributed throughout the classroom. (Contains 33 references.) (Author/MES)

Academic Help Seeking and Peer Interactions of High School Girls in Computer Science Classes

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Abstract: Through interviews and classroom observations, this study investigated the academic help-seeking and interactions of high school girls with their computer science classmates. This study investigated these behaviors in both a private school and a public school setting. The study explored five aspects of this help-seeking interaction: a) females as a gender minority in computer science, b) determinants of peer interaction, c) teacher versus peer assistance, d) factors detracting from willingness to assist peers, and e) preference for group interaction. A key finding in this study was that physical proximity was an important determinant of help-seeking behaviors in a high school computer lab. Another finding was that girls in the sample studied often asked their peers for help even when they preferred the teacher's help and believed that the teacher was more knowledgeable. One particularly counter-intuitive finding in this study was that most girls preferred to work individually in a setting in which there was already substantial peer interaction. One implication of this study is that teachers should be wary of applying the general finding that girls prefer group work to every girl in the class and should instead respect the preference of the individual. If the findings obtained in this study are found in other settings, then a recommendation might be that in order to maximize help-seeking, talented programming students should be evenly distributed throughout the classroom.

Academic Help Seeking and Peer Interactions of High School Girls in Computer Science Classes

The underrepresentation of girls and women in computer science classes, computer-related majors, and technological careers has been a concern since the origin of the field of computing (Bunderson & Christensen, 1995; Hoyles, 1988; Temple & Lips, 1989). Researchers have reported that females feel less comfortable with and seem to fear computers more than do males (e.g., Shashaani, 1997). Females have been described as less confident than men in dealing with computers, more anxious about computers, less excited about computers, and less eager to learn about computers than men (Colley, Gale, & Harris, 1994; Shashaani, 1997).

Evidence exists, however, suggesting that previous experience with computers partly accounts for these differences (Bunderson & Christensen, 1995; Miura, 1987; Shashaani, 1997; Wilder, Mackie, & Cooper, 1985; Yelland, 1995). Shashaani indicated that training and experience improved female attitudes, but warned that females must acquire this experience before they reach college. Miura noted in particular that completion of a high school computer programming course was the most important predictor of computer self-efficacy for females. Wilder, Mackie, and Cooper showed that, as opposed to more general introductory computer courses, only courses in which students learned a programming language increased females' sense of competence with computers.

This underrepresentation of females in computer science courses has been a concern for at least three reasons. One reason is the basic issue of fairness. Are high school girls avoiding computer science because they feel inadequate and unprepared or simply because they are attracted to other academic subjects (Temple & Lips, 1989)? If the former is the reality, then high school computer science programs may be systematically unfair to girls. The second concern is that for the United States to be competitive internationally, it should produce the finest computer science students it can of both genders. If girls are being denied representation in computer science fields, then the United States may not be as competitive internationally in this field as it could be because it is not tapping the intellectual resources of half the population. The third concern is that the female perspective may be notably absent in computer science classes. Without this perspective, we may be restricting the breadth of computer science understanding of all current computer science students. For example, an increased female presence in high school computer science classes could possibly shift the focus away from individual assignments towards group assignments; this is actually closer to the model employed by computer consultants in the field than the working-alone model is.

Although a great deal of interaction exists among students in the computer lab, evidence suggests that females who learn programming have been less enthusiastic than males about the environment (Huber & Schofield, 1998). Furthermore, Schofield (1995) has suggested that because females anticipate being in the minority in a computer science class, they may be more reluctant to enroll in these courses.

Because teachers of computer science have often been busy helping individual students (Damon, 1984), much of the peer interaction that takes place has involved help-seeking behaviors among students themselves. Typically, females have been more likely than males to seek help (Nadler, 1991), and they chose peer helpers based on such factors as expertise, friendship, willingness to help, and gender (Nelson-Le Gall & Glor-Scheib, 1985; Newman, 1998). A distinction has also been made between instrumental help-seeking, in which a student has sought to acquire only the help necessary to proceed in solving the problem, and executive help-seeking, in which a student has attempted to have the problem completed by a helper (Nelson-Le Gall, 1981).

Traditionally, research on help-seeking has relied on students' self-reports. Motivation theorists have called for direct observation of classroom interactions and interviews of students to address the rich complexities of the classroom environment (Schunk, 1991). Following the line of inquiry on academic help-seeking established by Nelson-Le Gall and Newman, and in keeping with the recommendations of motivation theorists, the present study used observations and interviews to investigate the academic help-seeking and peer interactions of girls in a computer science classroom. The purpose of the study was to discover the factors that influence how and why girls engage in academic help-seeking and interact with their classmates in high school computer science courses. For example, do girls in high school computer science classes ask questions of only their most capable classmates? Do girls in high school computer science classes prefer to work in groups, or do they prefer to work alone? Do these girls perceive a difference between the assistance given by the teacher and the help given by their peers? Not only might answers to

these questions help guide researchers, but they might also assist classroom teachers in making educated choices in setting up their classrooms to encourage successful peer interaction.

Girls and Academic Help-Seeking

Females as a Gender Minority in Computer Science

Researchers have determined that males are more likely than females to enroll in optional computer courses (Hoyles, 1988). Furthermore, activities such as programming are frequently perceived as inappropriate for females because they are viewed as being in the male domain of math and science (Bunderson & Christensen, 1995; Hoyles, 1988). This may be one reason that males have more experience than females with computer science in particular (Temple & Lips, 1989). Collis (1985) pointed towards a fascinating perception of females concerning computer ability that is deemed the "We can but I can't" paradox. This is the belief that females in general are just as capable computer users as males, but that females view themselves individually as less capable with computers than males.

Schofield (1995) observed females in the second course of a sequence of two high school computer science courses. In each of the two classes she observed there were only two females. Only one of these four broke out of a pattern of social isolation, and none established any form of continuous working relationship with classmates. The two females in each class rarely spoke, on either a social level or as related to class projects. Schofield discovered continuous teasing of the females in one of these classes, which was serious enough to be labeled sexual harassment.

Peer Help-Seeking

In research that did not involve computers, a consistent finding in student group interactions has been that the most capable students give the most help to the members of their group (Webb, 1982). Less consistently, the least capable students seem to receive the most explanations from members of their group. Aside from a peer's ability, another factor that may influence a student's choice of a classmate with whom to interact is the relationship of the students, particularly the friendship status (Barbieri & Light, 1992). Students also choose peer helpers based on such factors as willingness to help and gender (Nelson-Le Gall & Glor-Scheib, 1985; Newman, 1998).

Schofield (1995) categorized two patterns of giving assistance in the computer science classrooms she observed. The first pattern was reciprocal help between friends. These friends were often of the same race and gender, and conversations between friends transitioned easily between socializing and working on the programming task. The second pattern was help given by one talented programming student to a wide variety of others. Often these helpers were known as "wizards," and they were almost always male.

Jackson (1994) noted that in his study of peer interaction some students within a group were torn between helping their partners and trying to achieve a high grade. He also noted that some of the weaker students actively tried to avoid their jobs within the group. Webb (1984) specifically organized groups in her study so that students of similar experience levels were placed together, because she feared that more experienced students would become frustrated with those of less expertise. She also suggested the possibility that students who asked for help were often interested only in completing the task rather than learning from the explanation.

Teacher Versus Peer Assistance

Researchers have suggested that for certain material students may be more effective than teachers in communicating with other students (Damon, 1984; Ellis & Rogoff, 1982; Webb & Lewis, 1988). According to Johnson and Johnson (1987), "the interaction that most influences students' performance in instructional situations is student-student interaction" (p. 2). This may be due to the use of a common language level and perspective, the directness of the approach, or because students working on the same problem may be more attuned to the difficulties of the project (Chandler, 1984; Damon, 1984; Ellis & Rogoff, 1982; Webb & Lewis, 1988). Sullivan and his followers also suggested that the sharing of ideas, the goal of consensus, and the willingness to compromise differentiate peer interaction from adult-child interaction (Damon, 1984).

Another important consideration is that as regards computers, teachers may not have the traditional edge in expertise over children (Light & Blaye, 1990). Furthermore, researchers have noted that peer collaboration frees the teacher of the demand to help a great number of students simultaneously (Damon, 1984; Diem, 1986). Certainly the report of children helping each other on the computer is a common one (Clements, 1987; Light & Blaye, 1990). Sheingold and others have indicated that computer science students in particular are likely to identify their classmates as potential helpers (as cited in Chandler, 1984). Schofield (1995) noted that students felt free to discuss and evaluate the help of peers. Some students preferred peer help to teacher assistance because they were able to understand a helper with a similar level of knowledge or manner of speaking.

Researchers have discovered differences between the teaching of adults and that of peers (Ellis & Rogoff, 1982). Students tend to help through demonstration and modeling, whereas adults depend more on verbal instruction (Ellis & Rogoff; Webb & Lewis, 1988). Ellis and Rogoff also observed that in their study adults allowed for more learner participation than did peer instructors, and learners tested better when taught by adults than by peers. Peer teachers focused more on actually completing the task than on the teaching of general rules.

Preference for Group Interaction

Although males tend to prefer to work alone while programming, females seem to prefer collaboration (Barbieri & Light, 1992). Researchers have also noted that individuals in groups at a computer have consistently learned as much or more than individuals working alone (Barbieri & Light; Light & Blaye, 1990). However, Colbourn and Light (1987) have warned that in their research even children working alone on a computer had access to other children and in fact talked almost as much as those working in groups of four. Diem (1986) concurred, observing students interacting immediately despite teacher insistence that students work alone. Diem suggested that students rely on each other more as the complexity of the assignment increases.

Sheingold and others have made clear that students are reluctant to work in a group with someone who might dominate the computer interaction, even if that student is quite knowledgeable (as cited in Chandler, 1984). Huber and Schofield (1998) observed that one student in a pair often controlled the keyboard. Jackson (1994) noticed tension within groups when more experienced computer users had exclusive use of the keyboard. Light and Blaye (1990) however have insisted that students do not seem to learn less because of reduced keyboard access.

Some teachers nevertheless seem to sense a certain difficulty with students working in pairs. In a study conducted by Huber and Schofield (1998), one of the observed teachers stated that the only pairs that functioned well were those pairs which were composed of friends. When the pairs were not friends, the teacher noticed that only one student of the two worked on the project.

The current research was undertaken to extend the research on the naturalistic computer science classroom, with a particular focus on female participation. To accomplish this goal, I examined the following questions:

Research Questions

Research Question 1: How do girls in selected high school computer science classrooms respond to being in the gender minority in the classroom?

Research Question 2: Which peers do girls in selected high school computer science classrooms ask for help, and why?

Research Question 3: What reasons (if any) do these girls provide for not giving help to classmates seeking their assistance?

Research Question 4: Do these girls see a distinction between peer help and teacher help, and if so which do they prefer?

Research Question 5: Would these girls prefer to work alone or in traditional groups, with the classroom environment held constant?

Methodology

Many of the studies investigating girls in computer science are quantitative in nature. Yin (1993) suggested that qualitative study is particularly appropriate when the event being examined is intertwined with its context and when "how" and "why" questions are being investigated. McCracken (1988) suggested that an interview can help the researcher to enter the "mental world of the individual . . . to see and experience the world as they do themselves." The intent of this study, therefore, was to discover the factors that influence how and why girls engage in academic help-seeking and interact with their classmates in high school computer science courses. This study was comprised of both observations and interviews.

Participants and Setting

School A was a 1000-student Catholic school composed of grades 7 through 12. School B was an 1100-student public school, composed of grades 9 through 12. Both schools were in the southeastern United States. School B was purposefully selected based on the fact that it is an ethnically diverse public school whose students generally come from a lower socioeconomic status than the students at School A.

There were a total of five girls in all of the computer science classes at School A. All of them participated in my study, and they were all given pseudonyms to protect their anonymity. They were enrolled in four different computer science classes, each taught by the same male teacher (see Tables 1 and 2). This teacher was 31 years old, married, tall, athletic, and in his eighth year of teaching.

There were a total of 20 girls in all of the computer science classes at School B. The parents of two of the girls enrolled in the introductory classes declined to sign permission forms granting me interview access. All of the girls were given pseudonyms to protect their anonymity. These 20 girls were enrolled in three computer science classes, all taught by the same teacher (see Tables 1 and 2). This teacher was 31 years old, married, and in his ninth year of teaching. He had a ponytail and often discussed computer games with his students.

Data Collection

I observed each of the seven computer science classes (see Table 1) on four occasions, for a total of 28 hours of classroom observations. Each observation lasted the duration of the class period, and detailed field notes were taken on the behavior of female class members. Field notes were coded inductively, consistent with the recommendation of Yin (1993). As Merriam (1998) suggested, these observations allowed me to observe occurrences that participants no longer noticed. These observations also allowed me to understand the context, and provided me with refined, probing interview questions. Observations also allowed participants to become more familiar with me. Finally, observations allowed me to triangulate interview findings. Observations spanned a period of one month and were approximately weekly, beginning with the second week of school. I intentionally visited classes on different days of the week, so that I would not merely see typical behaviors for any one day of the week.

Each of the females in all of the fall term computer science classes, and a parent or legal guardian, were asked to sign an informed consent form to grant an interview. Each student was then interviewed over a three week period, using the attached interview guide (see Appendix A), in a semi-structured interview format. As Merriam (1998) explained, the semi-structured interview focuses on issues without being restrained by an exact, predetermined order of questions or specific wording of questions. Merriam indicated that "this format allows the researcher to respond to the situation at hand, to the emerging worldview of the respondent, and to new ideas on the topic" (p. 74).

The interview guide was developed by reading the literature on peer interaction and academic help-seeking, especially as it relates to computer classes, and by classroom observations, including those of an introductory programming class at School A done during a pilot study in early 1999. Broad categories emerging from these two sources were (a) giving and receiving help from classmates, (b) choosing with whom to interact, and (c) preference for interaction. Attempts were also made to formulate the questions into the four major categories suggested by Merriam (1998): hypothetical, devil's advocate, ideal position, and interpretive questions. Every effort was also made to avoid the types of questions that Merriam warned interviewers to shun: leading questions, multiple questions in a

single interrogative, and yes-or-no questions. Much of this guide was given a trial run during my pilot study in the spring of 1999.

Data Analysis

Observations and interviews were coded inductively using the Ethnograph. Trained assistants coded three data files, to measure inter-rater reliability. We had an average of 87% agreement on our coding of respective data files. Appendix B contains code definitions for my observations and interviews.

I attempted to triangulate the findings from my observations and interviews, cross-checking them to ensure that the results were reasonable from both sources of evidence (Merriam, 1998). Including more than one case also contributed to the external validity of this study. I also included member checks, asking both teachers and one student from each school to confirm the accuracy of my observations and the reasonableness of my interpretations (Yin, 1993). Finally, during my study I kept a detailed research log of how data were collected, how codes emerged, and how decisions were made in order to maintain the chain of evidence (Yin, 1993).

Researcher Perspective and Bias

As a former computer science teacher of nine years, I entered this study with certain biases and a definite perspective. I felt confident, for example, that students were capable of helping each other. I also believed that in a computer science class setting, peer help would often be required, as the teacher cannot possibly help all students simultaneously. However, I also held a firm belief that there was a distinction between aiding fellow students and doing the work for a peer. Thus I was inclined to listen carefully to student conversations to ascertain which of these situations was occurring when students were discussing a project.

I also believed that females were at least as capable as males in the area of computer science. Having taught exceptionally talented females and having worked with outstanding female programmers left me dismayed at the proportional underenrollment of females in computer science. One of the motivating factors behind this study was the perplexing consistency with which the computer science classes I taught had been overwhelmingly male-dominated.

Because this was a qualitative study, the results cannot be generalized to the population. However, instead of hypothesis *testing*, hypotheses may be *generated* (Merriam, 1998). Furthermore, by supplying rich, thick description, this study allows for reader or user generalizability, which Merriam described as allowing others to decide how well this study applies to their particular scenario. My study assumes that the classes I visited were typical classes that were not particularly influenced by my visits. I also must assume for this study that the participants gave me authentic data during interviews. The interviews were certainly influenced by the fact that I am male and the students interviewed were all female.

Context

A pilot study was conducted at School A during the winter and spring of 1999. Eight girls participated in this study. Results of this pilot study suggested that students generally chose peer helpers based on proximity, knowledge, and friendship. Furthermore in this study girls claimed to prefer the teacher's instrumental help-giving rather than their peers' executive help-giving. Some of the girls in this study preferred to work in groups, while others preferred to work alone.

At School A, all students were required to take a keyboarding class and a computer applications class; any computer science classes students took after these two courses were optional. At School B students were required to take a single computer class, either keyboarding or beginning programming; any further computer science courses were optional. This distinction in requirements may have affected the results, because the students at School A had more experience with computers in the classroom upon entering the introductory computer science course.

A typical class period at School A began with a lecture by the teacher, followed by a period of student programming. The lecture portion of the class spanned anywhere from 5 minutes up to 50 minutes of the 55 minute

class. Typically the lecture portion was under 20 minutes. Towards the end of the trimester, the students programmed for the entire class period with no lecture from the teacher. Students were allowed to choose their own seats daily.

A typical class period at School B began with the teacher addressing the students in the classroom across the hall from the computer lab. The teacher generally took roll or gave a brief lecture before escorting the students across the hall to the computer lab, where they would program for the remainder of the class period. On one occasion (during a time when I was at the school for an interview) I observed that the teacher lectured in the classroom for the entire period. There were instances when another class of students shared the computer lab with the computer science class. In those instances two or more computer science students sometimes shared a single computer. This was rare though, based on comments by the teacher and the students. The students were allowed to choose their own seats at the beginning of the class, but were then encouraged to stay in that seat because their programs were saved on that particular computer's hard drive.

At both schools, the period of student programming following the teacher's lecture was characterized by two defining features. The first feature was that the teacher at each school moved among the students, offering help to students whose hands were raised or who asked for help as the teacher walked by. Typically the teacher at School B spent longer with each student, sometimes even sitting down in their seats. He was also more preoccupied with solving any hardware problems, sometimes spending as long as 16 minutes fixing a single computer hardware problem. The second defining feature in both schools was that students generally talked quietly among themselves, asking each other questions about their computer projects and sometimes just socializing. Because they realized that they could not spend time helping every student to the extent that each student desired, both teachers encouraged students to help each other. School B tended to have a noisier computer lab than School A did, partly due to the relaxed style of the teacher and partly due to the sheer number of students.

It should be noted that the culture of the classroom at both schools allowed for students to get out of their seats to seek help from classmates or just to socialize as long as the conversation did not get too loud. There were instances in each of the seven classes in which students walked across the room to get assistance from another student, to pick up a printout, or just to talk to a friend. At no time during my 28 hours of observations did I hear a teacher reprimand a student for standing up or getting out of her seat.

The classes at School A tended to move at a faster pace than the classes at School B. This was partially attributable to the fact that classes at School A were smaller and the teacher was able to spend more time clarifying issues individually with each student. Another reason for the difference in speed of coverage was that the teacher at School A merely collected the homework and graded it outside of class, while the teacher at School B went to every student's computer during class time to grade each student's program. This entailed the teacher running the student's program, filling in a sheet of seven yes/no questions, and then assigning the student a grade. Because this was so time-consuming with so many students, there were entire days at School B during which nothing new was taught.

The tests given at each school also seemed to reflect different goals for the class. At School A, the tests primarily required students to write programs. At School B, the tests were primarily fill-in-the-blank and matching questions designed to explore computer knowledge in general, and then students were asked to write a single computer program. This may have been related to the school requirements for computer classes. The teacher at School B may have been attempting to give his pupils more of an overview of computers rather than merely teach them how to program, whereas this was not a need at School A.

At School A, the teacher used the whiteboard to lecture at the beginning of class and depended heavily on student participation, sometimes getting frustrated if he did not receive it. The discussions generally revolved around what the students were trying to do by writing a particular program, and only occasionally revolved around a new command. The teacher at School B had students copy notes word for word which he projected from an overhead transparency. These notes were almost exclusively devoted to syntax, and there was no discussion of the notes. Instead the teacher read the notes aloud to the students to be sure that the written words were clear.

Finally, another difference in the teaching between School A and School B was that the teacher at School A would sometimes stop the entire class during programming time if the same question was being asked of him

repeatedly. He would then discuss the problem, using the whiteboard, with the entire class. After about a month of school, the teacher at School A started to insist that the students flowchart their programs before writing them, and would sometimes check to see if they had done so before answering their questions. At School B the teacher would not stop class if he was asked the same question repeatedly; instead he would patiently continue to help each person individually.

Results

Certain trends emerged from the observations and interviews conducted over the two month period of the present study, as codes were repeatedly used. The five overall themes were (a) reaction to being in the gender minority, (b) determinants of peer interaction, (c) factors detracting from willingness to help peers, (d) teacher versus peer assistance, and (e) preference for group interaction.

How do these girls respond to being in the gender minority in the classroom?

The girls in this study were generally aware of their status as a gender minority in the classroom. About half of the participants said they wished there were more girls in their classes, but the other half claimed to be comfortable with the gender mix. More girls made negative statements about their gender's involvement in computer science than made positive statements. Nevertheless, almost all of the girls in this study were accepted socially in the classroom, and many had partners with whom they worked regularly on programming assignments.

In observations at School B there were instances of two girls regularly working together, three girls regularly working together, one girl regularly working with two boys, and one girl regularly working with one boy. The only girl who seemed somewhat isolated socially was Martina, and this appeared to be due more to her language skills and her late arrival into the school and the class than to her gender. At School A the two girls in the only class with more than one girl did not work together as regular partners. However, none of the five girls at School A was socially isolated, and all had peers available whom they asked for assistance. Sabrina and Vanessa both had regular partners with whom they worked on their projects.

Twelve of the girls in this study, including all three girls who were the only female representatives in the class, claimed that they were comfortable with the number of girls in the class. Eleven of the girls in this study said that they wished there were more girls in their classes. Two girls specifically cited an instance of a boy picking on a girl, but neither seemed to believe that it was specifically harassment based on gender. It seems possible that some of these girls may have just gotten "used to it" and therefore might not even pay much attention to boy-girl teasing in computer science classes.

Only two of the girls in the class with 11 girls enrolled wished they had more female students in their class (20% of those interviewed). On the other hand, 9 of the remaining 13 girls interviewed (69%) wished they had more girls in their classes. This is not particularly surprising given the fact that the girls' status as a gender minority was much clearer in classes with very few girls enrolled. All five of the girls in the non-introductory classes wished for an increased female presence, which is again not surprising because these classes had among the fewest girls enrolled. For the same reason, four out of five girls enrolled at School A expressed a desire for more girls in their class. Interestingly, only 1 out of 7 African American girls expressed a desire for more girls in the classroom, whereas 10 out of the other 16 girls wished they had more female students in the classroom.

Six girls in this study made comments about girls that were not particularly positive. On the other hand, three girls made statements regarding the fact that girls were just as capable or more capable than boys. Melony claimed that some of the best programmers in the class were girls, and maintained that "[the girls] know what we're doing, so far. And, you know. I would get done before someone else would—a boy. So…I think the girls are turning out to be better than some of the boys."

Two girls made interview statements that made it appear that they believed they were representing all girls. Kally explained that "…if I'm behind the entire class I feel really inferior because I'm the only girl! And I'm the slowest girl, or whatever. It would be different if there were other girls with me…."

Although the girls in these two schools were generally aware of their status as a gender minority in the class, most of them were nevertheless able to successfully integrate themselves into the working environment of the classroom. Some of the girls believed that friendship was actually a more important relationship for them than gender in the computer science classroom. Many of the girls seemed aware of the stereotyping involving female students in the computer science environment.

Which peers do girls in selected high school computer science classrooms ask for help, and why?

Observations and interviews suggested that there were a number of factors that determined from which classmate a student requested help. These factors included friendship status, knowledge of computer science, gender, willingness to help, proximity in the classroom, similar working paces, similarity of projects, and common spoken language. Table 3 indicates whether each girl in this study cited a given determinant of peer interaction as being important in her interview.

As can be seen in Table 3, every girl in both schools who asked for peer help cited proximity as important in determining from which peer she would seek help. Every girl except Amanda also cited knowledge as being important, and Amanda stated during her interview "of course everybody is smart." Lilly, described by her teacher at School B as "very bright" and "in the gifted program," was the only girl who claimed to have never asked a peer for assistance.

Erin claimed that her first reaction upon encountering difficulty was "I just ask the person beside me." Kally definitively explained her views on whom to ask for help.

> Interviewer: Which student do you ask second for help?
>
> Kally: The person on the other side [of me] (laughing). If there's only one—like if I'm sitting on the edge when there's only one person there, I'll ask that person, and then if they don't know, then I'll turn my chair around and ask the person behind me. Something like that. You know. It's no big thing, but normally I ask anyone close to me.

I observed numerous instances during classroom observations of students turning to their neighbors for help; it was much more rare to see students walking across the classroom for help, although it did occur in each of the seven classes I observed. The level of the class did not seem to influence the girls' decision whether or not to walk across the classroom for help.

Knowledge was also an important factor for these girls in deciding whom to ask for help. Vanessa claimed that the primary quality she was seeking in a peer helper was "if they know what they're doing." Again, classroom observations confirmed that in many of these classrooms there were acknowledged experts to whom many questions were directed.

Because the pilot study made it clear that both knowledge and proximity were important, I designed interview questions to determine their importance relative to each other. The first question designed to aid in this clarification was: "How did you choose where to sit?" Possibly these girls could have chosen to sit by classmates they knew in advance to be good with computers, in which case proximity would naturally be the result, but knowledge would have been the primary instigation in their choice of peer helpers. Only four girls said that they explicitly chose to sit near someone they knew was good at computer science.

The second question designed to clarify the relative importance of proximity and knowledge was: "If the [person mentioned as the first person to ask for help] were sitting across the classroom, would you still ask that person for help?" Approximately half of the students said that they would not make that effort. Because only four girls explicitly chose where to sit based on sitting near a knowledgeable person, and approximately half of the girls said that they would not walk across the room to ask someone knowledgeable, the data support proximity as being more important than knowledge, although both are valued.

Aside from proximity and knowledge, the next most cited factor in determining a likely peer helper was friendship status. All but four of the girls mentioned a friendly relationship with their peer helpers as being important.

There was a great deal of crossover in many of the factors cited as reasons for choosing a peer helper, particularly among the primary three reasons listed above. For example, Vanessa mentioned all three when she stated that she chose a peer helper "because he's *right next to me* and *I know him* and *he generally knows what he's doing.*" (italics mine) This was not at all uncommon. Most of the girls included at least three reasons.

The other reasons for choosing a peer helper were cited considerably less often. Four students believed that a willingness to help was important enough to specify. In one case, confirmed by observations, unwillingness to help was cited as a negative trait. Four girls also cited students learning at a similar pace or having a similar level of knowledge as being important factors in determining from whom they sought help.

Five girls believed that gender was important in their selection of peer helpers, and four specifically believed that the helper should be female. Amanda stated that "usually I ask a girl first and then a guy" and confirmed that if her neighbors were of different genders, she would ask the girl first. These girls were explicitly aware of asking females for help, and had reasons why they might do so. Interestingly, of the three Vietnamese girls who participated in this study, two of them cited gender (female) as an important determinant in whom they asked for help.

An interplay that may need to be explored further is that between friendship and proximity. Because the teachers in this study did not assign seats, 11 of the girls in this study claimed that they chose to sit near a person with whom they were friendly on the first day of class. This would certainly account for a relationship between these two factors. Some of the girls denied sitting near a friend, and some girls claimed that they really were not friendly with anyone in the class outside of the classroom, but unassigned seating makes it difficult to cleanly separate proximity from friendship. Of course girls in each class could also become friendly with neighboring students as the term progressed.

Interestingly, of those girls in the introductory course, only 1 girl out of 18 believed that it was important to ask another girl. On the other hand, of those students in more advanced courses, three girls out of five mentioned the importance of getting help from another girl. When looking merely at those enrolled in the Advanced Placement courses (all of whom had taken at least two-thirds of a year of computer science), three girls out of four stressed the importance of seeking help from other girls. Perhaps the help-seeking preferences of these more advanced programming students evolved over time, whereas the more novice programming students had not yet fully developed their ideas of help-seeking in the particular context of a computer science class.

Another factor to be mentioned in this study was working on a similar project. Martina, an exchange student from the Czech Republic, was the only student to cite a common spoken language as a factor. "He's from Ukraine [*sic*] and I speak with him in Russian," she noted. This was the only instance in which nationality or race was explicitly stated to play a part. However, in observations at School B, Erin (who was White) sat next to two White boys who were her primary sources for help. Furthermore, Mary, Selena, and Nancy, all Black students, worked together on a daily basis. It seems likely that race was an unspoken factor influencing at least some of these girls' decisions as to whom to ask for help. In addition, race could have also influenced friendship decisions, indirectly influencing help-seeking behaviors in this fashion.

In summary, the primary factors that determined from which classmate a girl requested help included proximity, knowledge, and friendship, in that order. Other factors included gender, willingness to help, similar working paces, similarity of projects, and common spoken language. Race may have been an unspoken factor involved in the decision-making process.

What reasons (if any) do these girls provide for not giving help to classmates seeking their assistance?

There were six major reasons cited by these high school girls for not giving help to classmates who requested it. The most cited reasons were the need for time to do one's own work and lack of necessary knowledge. Fifteen girls said that they would gladly help if they actually knew how to help on that particular problem. Vanessa was the only

one who said she might also use this as an excuse. All of the students at School A mentioned this reason to not help peers, which might reflect the uncertainty they felt in a challenging academic course.

Fourteen girls believed that if students were busy with their own work or needed time to complete their own projects that they might be less likely to give help. Again, this group of girls included every student at School A, suggesting that they may have been more pressed for time due to the faster pace of the class. Students at School B seemed less worried about this aspect because the workload was less strenuous.

All seven White students in this study cited both of the above reasons for not helping peers. This may be mostly attributable to the fact that five of the students attended School A rather than to any racial difference. Nevertheless, it stands out in stark contrast to the 2 (out of 16) students of other races or nationalities who did not cite both of these reasons for not helping a peer.

A closely related reason for not helping a classmate was if the question asked was extremely lengthy. Nine girls believed that a long question would be less likely to receive an answer, again including all five students from School A. Six girls believed that it would depend on the nature of the individual whose help was sought or on the progress that the helping student had made with her project.

Three students stated that a legitimate reason not to help a classmate would be if they believed that the person asking for help could get a more satisfactory answer from another classmate or the teacher. The primary rationale these students cited rested on lack of knowledge as a foundation.

Sabrina from School A was the only student who insisted that she would not always help a classmate who merely wanted to know the answer.

> The other day I worked for like 45 minutes to try and figure out this, this, prime project that we're doing. And it took me so long to figure out how to make the prime factors show up, and this one kid is like, "Tell me how you did that." I don't want to tell him. It just took me so long to do it. I just want to be like (sarcastically), "Oh yeah, just type this in. Go ahead."

She explained that she handled this situation by telling the student to "go make pseudocode for it, and think about how he wanted to put it, and then he could ask me to kind of show him how to do it, but I wouldn't just give him my code or anything." On the other hand, Mary from School B claimed that "if they need to get a piece of paper and come write it down, you know, I'll be more than happy. They can look on my screen anytime."

Field observations confirmed that there were indeed times that students at School A did not help classmates when they were asked for help. The primary reason for denying help seemed to be a desire to work on one's own program. One girl was denied help from a boy for this reason, and one girl denied help to a boy for the same reason. There were instances of momentarily delayed peer help at School B, but no observed instances of help to peers denied.

The primary reasons the girls in this study supplied for not giving help to classmates who requested it were the need for time to do one's own work and lack of necessary knowledge. Other reasons cited included a question that was particularly lengthy, the belief that others could better help the classmate, a bossy classmate asking the question, or a student asking for help who merely wanted the answer. Most of the girls in this study claimed that they would help their classmates in most situations if they had the knowledge to help and were not in the middle of an important project of their own.

Do these girls see a distinction between peer help and teacher help, and if so which do they prefer?

Because of the perceived unavailability of the teacher as he moved across the classroom helping students, a majority of the girls in this study first asked their peers for help instead of the teacher. However, more of the girls in this study stated a preference for the teacher's help than stated a preference for student help. Because the teachers at

these two schools gave help to students in different ways, girls at the two schools tended to give different reasons for their preference in helpers.

Sixteen of the girls, cutting across both schools, mentioned that the teacher was frequently busy helping other students. Observations at both schools confirmed that the teachers tended to move around the room helping different students for periods of time. Sometimes this led to frustration. The teacher at School B tended to actually sit down and spend a longer amount of time with each student he helped, and more actively encouraged students to help each other than the teacher at School A did.

Surprisingly, the comment that the teacher was always busy did not seem related to teacher, to class size, or to school. The students in the two smallest classes (enrollments of 9 and 11, both at School A) commented on how busy the teacher was, while four of the girls in the two largest classes (enrollments of 26) did not attest to this fact. In fact four out of five students at School A explained that the teacher was frequently unavailable, even though he moved around the computer lab relatively quickly and was generally dealing with smaller classes. Surprisingly only 3 out of 7 African American girls (43%) mentioned that the teacher was frequently too busy to help, whereas 13 of the other 16 girls (81%) made this claim.

Largely in reaction to the perceived unavailability of the teacher, 13 girls claimed to first ask other students for help, as opposed to first asking the teacher. All of these girls were from School B, and this group included every member of the AP class at School B. One of the girls, Melony, had never asked the teacher a question and therefore naturally first asked her peers. Five girls said they first asked the teacher for help, as opposed to their classmates. One of these girls, Lilly, had never asked her classmates any questions.

Five girls said that they sometimes first asked the teacher and sometimes first asked other students. Four of these were at School A, where students made a distinction between the way that the teacher and the students helped them. Three girls, all from School B, two Vietnamese and one Greek, claimed to be somewhat intimidated by the teacher. Certainly culture probably played a role in forming these three girls' relationships with the teacher.

Nine girls expressed a preference for the teacher's help rather than their peers' help. In addition, one girl, Lilly from School B, had never asked a student for help so could not make a judgment. There were some common reasons that these girls preferred the teacher's assistance, but there were also some differences in the way that the teacher at each school helped the students. This accounted for some variation in student reasoning.

At School A for example, Bobbie claimed to prefer the teacher's help because "he helps me understand it." At school B, Erin claimed to prefer the teacher's method because "he makes me get up...and sits down in the chair and does it himself...it's the easy way out...[but] I'm not really big on computer science, so yeah [I prefer the teacher's help]." The teacher at School B was observed to sit at the students' computers and type on a number of occasions.

Only five girls explicitly preferred student help over teacher help, but two girls claimed no preference, and six girls said that their preference was situational. Of the five who preferred student help, one girl, Melony, had never asked the teacher for help and so may not been able to make a good comparison. None of the students at School A expressed an outright preference for student help; instead they either preferred the teacher's help or believed that their preference was situational. The other two White students in this study also fit into this same category of preferences. The student method of helping was essentially the same at both schools. The one primary difference between schools was that only students at School B complained about the teacher speaking above their level of understanding.

Erin sometimes preferred the help of her classmates because "it's easier to get a hold of them." Furthermore, sometimes the teacher "gives too much information for me. He'll go into detail about something and use words that I've never heard of whereas Gene would just be like 'put this, type in your semicolon and you're fine.'" Jocelyn was one of a few girls who simply believed that "I feel [more] comfortable around my friends than I do with the teacher."

Although most girls in this study claimed to ask their peers for help before they asked the teacher for help, more girls actually preferred the teacher's help than preferred their peers' help. This apparent contradiction was explained by the teacher's perceived unavailability at both schools. Although the teachers at these two schools helped

students in different manners, one commonly perceived benefit of asking the teacher was that he was the expert in the subject area being studied.

Would these girls prefer to work alone or in traditional groups?

When given the option of the status quo in the classroom—each girl working on a computer—or working in a group on a single computer, more girls stated a preference for working alone. Of the 23 girls interviewed, 7 stated a preference for working in a group, 13 stated a preference for working alone, and 3 expressed some desire to work alone at times and to work in a group at other times.

Among those who said they preferred to work in groups, there were a number of rationales cited. Jocelyn was one of three students who believed that more ideas would lead to a stronger program. Allison believed that more eyes would make checking the work more efficient. Sandy was one of two girls who argued that a built-in group of helpers would be helpful. Describing the downside of working alone, Jocelyn explained that "[With] one person just—you either know it or not.... You can't share ideas." She later admitted, however, that she did sometimes get this exact type of help from students in the current lab situation.

Among those who said they preferred to work alone, there were a number of rationales cited. Nancy preferred to work alone due to personal accountability. Lilly simply stated that it was a personal preference. Jill focused on ease of completing the assignment. Vanessa focused more on understanding. She claimed, "I work better ...doing stuff myself because then it's my way and I understand it better." Those who preferred to work alone pointed out what they considered the downside to working in a group. Melony was one of two students who focused on keyboard time. Noreen was one of four students who believed she would not learn because either she would allow others to do the group's work, or others would simply take control because they were the most capable. Mary took this idea to the logical conclusion, worrying about her performance on tests if she learned nothing from group work. Nancy took the opposite tack, that of knowledgeable group leader frustrated with the rest of her group.

Selena was the student who had the most unique perspective. She claimed to be a "group person" in all of her classes, except those classes that worked with computers. Five other students also claimed that they would prefer working in total isolation rather than in a group setting. Jill was one of two students who claimed that she would like to be in isolation on occasion, although at other times she might require some guidance. On the other hand, Robin believed that she would always prefer isolation.

The only classes in which I observed any kind of formal group work were at School A. I observed two classes, both the introductory computer science courses, in which students were placed into pairs with the person in the next aisle to work on a project. In this project however, students remained at their own computers and completed their projects individually. However, the teacher repeatedly reminded them, "remember you are not alone—you have a partner" and encouraged them to ask their partners questions before consulting him. Additionally, Kally and Vanessa both mentioned in their interviews that in their classes at School A students had been paired together for a test. Interestingly, all of the girls at School A concluded that they preferred to work on projects alone.

Both sophomores in this study, Vanessa and Darne, expressed a preference for working alone. In addition, each White student in this study expressed a preference for working on projects alone. In contrast, four of the seven African American girls (57%) in this study exclusively preferred working in groups. Only 3 of the remaining 16 girls (19%) in the study exclusively preferred group work.

Most girls sought partners who would not waste time in a group, were smart, worked well in a group, were fun and friendly, and were willing to help. Bobbie also claimed that she sought partners working at the same pace at which she worked. Two girls claimed to be seeking "fun" partners. Thirteen girls sought partners who "wouldn't waste time" during group work, and nine were looking for partners who worked well in a group. Twelve girls wanted groupmates who knew the subject well, although two girls specifically stated that this was not important to them. Two girls said they certainly preferred to have friends in the group, two stated that it would be nice but didn't really matter, and three girls denied the importance of having friends in their group. Four specifically sought groupmates who were willing to help.

In summary, more girls in this study stated a preference for working alone rather than in a group on a single computer. This majority included those girls at School A who had had experience with group work in the computer lab. The majority of girls in this study preferred working alone for a number of reasons, including personal accountability, personal preference, increased understanding, and increased keyboard access. It is possible that some girls also found the setup posed in the question distasteful, in that they might have reacted negatively to having a number of students crowded around a single computer.

Discussion

Theorists who suggest that qualitative inquiry is required to reveal the intricacies of students' motivation are correct that these intricacies more readily surface when students' actions are observed and when their voices are heard than when surveys are the sole means of gathering data. Self-report instruments, in addition to their well-known limitations, bound student responses to the issues tapped by the items that comprise them. The girls in this study provided insights beyond those currently available. However, it should be noted that these results may be unique to the girls in the computer science classes at these two schools with these two teachers. Furthermore, many of the findings in this study may not be gender-specific. Because boys were not included as participants, it would be speculative to suggest that these findings are or are not specific to girls only.

For girls in computer science classes in two schools, physical proximity was an important determinant of help-seeking behaviors. Another finding was that girls in this study often asked their peers for help even if they preferred the teacher's help and believed that the teacher was more knowledgeable. One particularly counter-intuitive finding was that most girls in this study preferred to work individually in a setting in which there was substantial peer interaction. In general, girls in this study were aware of their help-seeking strategies and of how important a role help-seeking played in their classroom life.

Perceptions of status as a gender minority

Schofield's (1995) investigation of the experience of four girls in computer science classes revealed that the girls had negative experiences, as they were unable or unwilling to acquire help from their male classmates, establish ongoing working relationships with classmates, or even work together with their female classmates. In contrast, the girls in the present study were almost always easily able to gain the assistance of their peers, including their male classmates. A number of girls entered into ongoing working relationships with classmates, and this was true across schools. There were also regular instances at School B in which girls worked together. Due to the modest sample sizes in each study and the number of moderating variables, such as teacher attitude, influencing the results, this inconsistency in findings merits further research in more varied settings with greater sample sizes.

Determinants of peer help-seeking

As noted above, there were three primary characteristics that determined which students were most likely to be selected as helpers by the girls in this study: proximity, knowledge of computer science, and friendship status. Because for this sample physical proximity was a critical factor in girls' seeking help, attention to seating patterns in a computer lab might merit closer scrutiny. If future researchers obtain similar findings with other samples, then several strategies might warrant trials. One possible seating arrangement that might maximize help-seeking would be to evenly distribute talented programming students throughout the classroom. This would allow students to use capable peers as a resource when the teacher is busy assisting others, allowing them the opportunity to more easily cross their zone of proximal development (Vygotsky, 1978). It may also be advantageous for teachers of high school computer science to encourage friendships among their students. The policy of the teachers in this study to not assign seats seems to allow students to sit near their friends, which might in turn increase peer interaction and academic help-seeking. This could be beneficial, assuming that peer interaction is a positive attribute of a classroom and not a distraction.

The suggestion in this study that proximity might be an important factor in help-seeking behaviors has not received attention in either the help-seeking literature or the literature on the computer science lab environment. This might be a fruitful area for further study. Although it seems intuitively obvious, further study is necessary to confirm this hypothesis. Certainly the possibility that proximity is more important than knowledge would bring into question

some of the help-seeking strategies of these girls. Of course there are other possible explanations, ranging from the speed at which the various courses covered new topics to the amount that the teachers encouraged peer help to how comfortable these particular girls were standing up in any classroom setting.

Reasons for not helping classmates

The primary reasons that the girls in this study cited as reasons not to help their peers were lack of knowledge and the need to do one's own work. This avenue of exploring help-giving rather than help-seeking introduces some new research possibilities. Most of the current literature focuses on the students seeking help rather than those supplying it. It would be perhaps equally instructive to study the motivations supplied by help-givers, so that the other side of the help-giving equation was more fully understood.

The distinction between peer help and teacher help

Although more girls in this study preferred the teachers' help than preferred their peers' help, and almost every girl agreed that the teacher was a source of greater knowledge on the subject than their peers, more girls actually asked their peers for help before they asked the teacher for help. This was largely due to the perception that the teacher was not always available to assist them. Many of the girls said that their choice of peer help or teacher help depended on the situation. In some cases girls at both schools seemed to prefer executive help (for example, Jill said, "Just tell me how to do it"). At School A though, most of the girls believed that the teacher's method of "hints" (instrumental help) helped them "understand it better" so that they would "be able to do it again in the future." This suggests that this teacher's method of "hints" (instrumental help) could be taught to students so that they might use it in their help-giving. However, having students use the teacher's method of help-giving might destroy the very aspects of peer help that lend to it the strength attributed in the literature, most notably the directness of the approach (Webb & Lewis, 1988). As students at School B indicated, their peers often "understand it on my level" and are "on the same track as I am."

Because the teachers at these two schools provided help in such different ways, it is difficult to make a distinction in these girls' preferences for teacher help or peer help. Because of the complexity and variety of other factors, it would be nearly impossible to make a blanket statement about whom female students prefer to ask for help—even in computer science classes in just these two schools.

Working alone versus working in groups

Some girls in this study preferred to work individually in a setting in which there was already substantial peer interaction. Well-intentioned teachers may react to the generally reported finding that girls prefer to work in groups (Barbieri & Light, 1992) by insisting that most projects be the product of group work. Results of the present study sound a note of caution. Some girls may prefer the personal ownership involved in working individually and may feel that they learn more when working alone. Teachers should be wary of applying the general finding that girls prefer group work to every girl in a class and should instead respect the preference of the individual.

Many of the girls in this study were hesitant to work with others. This supports Sheingold's assertion that students do not want to work with others who may dominate the work (as cited in Chandler, 1984) and could explain the tension in the groups observed by Jackson (1994) when more experienced computer users monopolized the keyboard. Regardless of Light and Blaye's (1990) assertion that students do not learn less because of reduced keyboard access, the affective aspects of learning would appear to be affected if the negative expectations of these girls regarding group work were to come to fruition. Therefore, if group projects are undertaken, the teacher should pay particular attention to alternating student roles within the group and encouraging mutually supportive group members, as suggested by Jackson (1994).

Areas for Future Research

Further study is called for in a number of areas. There is very little qualitative research available that investigates a naturalistic computer science classroom. With the increasing availability of computers across the nation, the model of one person per computer may become the dominant classroom model in computer science classrooms in

particular. As of 1984, teachers assigned groups to computers less than half of the time (Webb & Lewis, 1988), and it would seem likely that increased availability of computers would see this number continue to drop. Although Colbourn and Light (1987) admitted that children working by themselves on the computer "engaged in very nearly as much task-related talk as children working in foursomes," there is a need for more systematic research of this naturalistic classroom setting.

Further study is also called for to investigate the stated preference of many of these females to work alone on their programs rather than in groups. It is possible that because they are satisfied with the amount of interaction already taking place in the classroom, that the perceived benefits of group work are relatively few. It appears that interviewing girls regarding their preference for collaborative work in computer science would strengthen the quantitative findings in this subject area. It is possible that other students such as Rashaun may also have a different understanding of the term "group project" than researchers might expect. More research would need to be done to make any definitive statements on this topic.

In summary, if similar findings occur with other samples, results from such investigations could hold possible implications both for educational researchers and for teachers of computer science. As regards research, additional investigations with larger samples would add critical information to our understanding of the importance of physical proximity in determining interactions in the computer lab. Appropriate analysis would determine the importance of preexisting peer interaction in the classroom as a factor affecting the preference of girls for group work. Also, investigation into the role of help-givers would round out the research on help-seeking. For their part, teachers of computer science might be encouraged to evenly distribute capable students throughout the classroom. Teachers might also be encouraged to think long and hard before relying exclusively on group work in the belief that it will be most effective for every girl in the classroom. Students might be encouraged to verbalize reasons for their help giving.

Because most interactions in the computer lab take place between students (Schofield, 1995), peer interaction is a natural focus for an investigation into the female experience in computer science classes. Additional insights into this experience can be developed by analyzing help-seeking behaviors in terms of the five classroom interaction patterns identified in this study. As these interactions are improved, girls may become more enthusiastic about their computer science experience. The logical aim of investigating these educational practices is of course to increase the number of girls and women in computer science classes and computer science careers.

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Appendix A

Interview Guide

Preference for interaction

- Some people would say that they would rather be given the assignment, a general introduction by the teacher, and then just be left alone to work. How would you respond to them?
  - Would that be a mode you would prefer?

- How do you prefer to resolve questions you have during class?
  - peers, teacher, on your own, use the book, look at someone's program

- Would you prefer more interaction during class, less, or about the same?

- How would you compare the amount of student interaction in this class with other classes you are taking?

With whom do you interact?

- Who do you usually ask first for help?
  - Why?/How do you choose which classmate to ask when you have a question? (friends, grades in course, age, understanding, seating proximity)
  - Who do you usually ask second, and why?

- How did you originally choose which seat to sit in during class?
  - (anything to do with sitting near a friend? A female?)
  - Do you ever change?
  - Why or why not?

- How many girls are in the class?
  - If you were to designate a gender mix, how many girls would be in the class? Why?
  - Does the number of girls in the class affect the way you behave in any way?
  - Does the number of girls in the class affect the way you work?
  - Are you happy with the number of girls in the class?

- Would you prefer group projects or working on your own?
  - What kind of partners would you select?
  - How many partners would you want?

How to get help

- Suppose I had a question about my program. How would I go about getting help from a classmate?
  - What if it's a question that will require someone to spend time looking at my program?
  - What if I don't agree with the answer?
  - Is that what you do?
  - Some students have told me that they like to debate with their classmates so they hear an explanation of the other person's side. Have you ever had a conversation with a classmate like that? If so, did you feel like you learned anything from the conversation?

How to give help

- If someone asks you for help, is there any reason you might not help?

Student/Teacher

- Does your teacher help you in the same way that your classmates do? Explain.
  - Which do you prefer?

Appendix B

Coding

INT:Code Book–Summary 12/12/99 2:03:28 PM

Code Word	Parent	Text	Definition	Modified	Added
FRI	CHO	YES	Chosen based on being a friend	09/29/99	11/03/99
GEN	CHO	YES	chosen based on gender, esp. being a	09/29/99	11/03/99
LAN	CHO	YES	Chosen because they speak the same	10/29/99	11/03/99
PAC	CHO	YES	Chosen because working at same pace	10/09/99	11/03/99
PRO	CHO	YES	Chosen based on proximity	09/29/99	11/03/99
SAM	CHO	YES	working on same project	09/30/99	11/03/99
SMA	CHO	YES	Chosen based on being smart in CSci	09/29/99	11/03/99
WIL	CHO	YES	Chosen based on willingness to help	10/09/99	11/03/99
ASS	CON	YES	Asked a different student for help	09/29/99	11/03/99
AST	CON	YES	asked teacher for help in response	09/29/99	11/03/99
TAL	CON	YES	had a discussion in reaction to	10/09/99	11/03/99
TRI	CON	YES	tried the suggestion in response to	09/29/99	11/03/99
EQU	DIF	YES	no preference for teacher or student	09/30/99	11/03/99
INT	DIF	YES	intimidated by teacher	10/09/99	11/03/99
NAT	DIF	YES	never asked the teacher a question	10/09/99	11/03/99
PRS	DIF	YES	prefer student help	09/29/99	11/03/99
PRT	DIF	YES	prefer teacher help	09/29/99	11/03/99
SFI	DIF	YES	Ask students first when have	10/09/99	11/03/99
STM	DIF	YES	student method of helping	09/29/99	11/03/99
TAB	DIF	YES	Teacher is always busy	10/09/99	11/03/99
TEM	DIF	YES	teacher method of helping	09/29/99	11/03/99
TFI	DIF	YES	Ask the teacher first when have	10/09/99	11/03/99
BOY	GIR	YES	reference to boys or girls as a	09/29/99	11/03/99
DER	GIR	YES	derogatory reference to girls	10/14/99	11/03/99
FIN	GIR	YES	happy with the number of girls--it's	10/09/99	11/03/99
GGG	GIR	YES	Girls just as good or better than	10/09/99	11/03/99
LIK	GIR	YES	liked being one of the girls in the	09/29/99	11/03/99
MOR	GIR	YES	Would prefer more girls in the class	10/09/99	11/03/99
NLI	GIR	YES	did not like being one of the girls	09/29/99	11/03/99
NOM	GIR	YES	gender doesn't matter at all	09/30/99	11/03/99
RAN	GIR	YES	reference to rank in class	09/29/99	11/03/99
REP	GIR	YES	feel as if representing all girls	09/29/99	11/03/99
WHI	GIR	YES	reference to "whiz kids"	09/29/99	11/03/99
CHO	None		How to choose someone to ask for	03/19/99	00/00/00
CON	None		conflict resolution	03/19/99	00/00/00
DIF	None		difference between peer and teacher	03/19/99	00/00/00
GIR	None		reaction to being a girl in the	03/19/99	09/29/99
NOT	None		Reason for not helping	03/19/99	09/29/99
PRE	None		preference for working alone, in	03/19/99	09/29/99
BET	NOT	YES	teacher or another peer would give a	09/29/99	11/03/99
DIS	NOT	YES	dislike the peer asking the question	09/29/99	11/03/99
DKN	NOT	YES	don't know the answer	09/29/99	11/03/99
LEN	NOT	YES	question is too lengthy	09/29/99	11/03/99
OWN	NOT	YES	Need to do own work, busy, no time	09/29/99	11/03/99
REC	NOT	YES	feel being taken advantage of/ no	09/29/99	11/03/99
ALO	PRE	YES	prefer working alone	09/29/99	11/03/99
FUN	PRE	YES	someone who is fun in the group	10/09/99	11/03/99
GRO	PRE	YES	Prefer working in a group	09/29/99	11/03/99
HAP	PRE	YES	happy with the amount of interaction	09/29/99	11/03/99
ISO	PRE	YES	prefer working in complete isolation	09/29/99	11/03/99
NIS	PRE	YES	do not prefer total isolation	09/29/99	11/03/99
NWT	PRE	YES	doesn't waste time in group	10/09/99	11/03/99
UNH	PRE	YES	unhappy with the amount of	09/29/99	11/03/99
WWG	PRE	YES	want in my group because work well	10/09/99	11/03/99

Code Word	Parent	Text	Definition	Modified	Added
AVO	None	YES	avoiding giving help, or putting off	02/19/99	11/14/99
BOY	None	YES	general comment about girls/boys	11/14/99	11/14/99
CON	None	YES	conflict over proposed solution	02/18/99	11/14/99
DOI	None	YES	doing the work for the peer; any	11/14/99	11/14/99
FAR	None	YES	someone far away helping	11/14/99	11/14/99
FEM	None	YES	female peer help	11/14/99	11/14/99
GIV	None	YES	giving help	02/18/99	02/19/99
GRO	None	YES	(teacher-assigned) group or partner	11/14/99	11/14/99
LOK	None	YES	Looking at someone's program	02/18/99	11/14/99
MAL	None	YES	male peer help	11/14/99	11/14/99
MUT	None	YES	muttering to oneself	02/18/99	11/14/99
NEI	None	YES	nearby peer helping	11/14/99	11/14/99
PAC	None	YES	peer help at same pace/place	11/14/99	11/14/99
RAN	None	YES	reference to rank in class	11/14/99	11/14/99
SHS	None	YES	sharing success or surprise with	02/18/99	02/18/99
SOC	None	YES	Social interactions	02/18/99	02/21/99
ST-GET	None	YES	acquiring help from peers	02/19/99	11/14/99
SUG	None	YES	suggesting a solution, either in	02/18/99	11/14/99
TE-GET	None	YES	getting help from the teacher	11/14/99	11/14/99
TE-WAIT	None	YES	waiting for the teacher to come help	11/14/99	11/14/99
TEL	None	YES	telling the peer directly how to do	11/14/99	11/14/99

Table 1. Classes

School	Language	Level	Course Length	Number of Girls	Grade Range
A	Visual BASIC	Introductory	Trimester	1 of 15	8–12
A	Visual BASIC	Introductory	Trimester	2 of 16	8–12
A	C++	Intermediate	Trimester	1 of 11	9–11
A	C++	AP	Year	1 of 9	9–12
B	Pascal	Introductory	Year	11 of 26	10–12
B	Pascal	Introductory	Year	6 of 26	10–12
B	C++	AP	Year	3 of 14	11–12

Table 2. Participants (Pseudonyms)

Name	Grade	Course	School	Number of Girls	Ethnicity
Erin	12	Introductory1	B	11 of 26	White
Robin	11	Introductory1	B	11 of 26	African American
Janice *	11	Introductory1	B	11 of 26	African American
Martina	11	Introductory1	B	11 of 26	Czech
Sandy	12	Introductory1	B	11 of 26	Vietnamese
Allison	11	Introductory1	B	11 of 26	African American
Nancy	11	Introductory1	B	11 of 26	African American
Noreen	12	Introductory1	B	11 of 26	Indian/British
Paula	11	Introductory1	B	11 of 26	African American
Mary	11	Introductory1	B	11 of 26	African American
Selena	11	Introductory1	B	11 of 26	West African
Amanda	12	AP	B	3 of 14	Vietnamese
Stephanie	12	AP	B	3 of 14	Burmese
Rashaun	12	AP	B	3 of 14	African American
Jocelyn	11	Introductory2	B	6 of 26	Nigerian
Janene	11	Introductory2	B	6 of 26	White
Tandy *	12	Introductory2	B	6 of 26	African American
Darne	10	Introductory2	B	6 of 26	Polish
Melony	11	Introductory2	B	6 of 26	Greek
Lilly	12	Introductory2	B	6 of 26	African American
Bobbie	12	Introductory1	A	1 of 15	White
Kally	12	AP	A	1 of 9	White
Sabrina	11	Introductory2	A	2 of 16	White
Jill	12	Introductory2	A	2 of 16	White
Vanessa	10	Intermediate	A	1 of 11	White

*parents would not consent to grant interview permission

Table 3. Determinants of Peer Help-Seeking

Name	proximity	knowledge	friendship	Gender	Willing to help	Similar pace or level	Similar project	Spoken language
Erin	x	x	x					
Robin	x	x	x					
Martina	x	x	x					x
Sandy	x	x		x-female				
Allison	x	x			x			
Nancy	x	x		x-male				
Noreen	x	x	x					
Paula	x	x						
Mary	x	x	x					
Selena	x	x	x		x			
Amanda	x			x-female				
Stephanie	x	x	x					
Rashaun	x	x	x	x-female		x		
Jocelyn	x	x						
Janene	x	x	x					
Darne	x	x	x					
Melony	x	x	x		x	x		
Lilly			(x)		(x)			
Bobbie	x	x	x			x		
Kally	x	x	x	x-female				
Sabrina	x	x	x		x	x	x	
Jill	x	x	x					
Vanessa	x	x	x					

(x) = has not asked classmates for help, but imagines that these are factors

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