Effects of using computers assignment

Education

Effects of Computer Use on High School Students' Sense of Community

MERVYN J. WIGHTING Regent University, Virginia ABSTRACT The author used a mixed-method design to determine whether and how use of computers in the classroom affects sense of learning in a community among high school students (N = 181). The results indicate that using computers in the classroom positively affects students' sense of learning in a community.

Analyses revealed that students believed that connectedness with their peers is the most important variable in developing a sense of community. Results suggest the following policy implications for urban education: (a) use of computers in teaching may add to the sense of classroom community and (b) sense of community is important and may be linked to academic success. Key words: computers, sense of community, high school education T echnological innovation has become a commonplace phenomenon and is frequently taken for granted by contemporary society.

In everyday life, technology plays an ever-increasing role; innovations, such as cellular telephones, hand-held computers, automatic teller machines, and digital videodisks, quickly become incorporated into daily use and are added to society's vocabulary. Information is available in far greater quantities than ever before, and the means to access and share it with others is unprecedented. Because the pace of sophisticated technological change is so rapid, however, little is known about its effect on the society that it pervades.

The classroom is a microcosm of society, and technology is having an increasing impact in schools throughout the country. In the same way that

little is known about how technology affects communities in general, little is yet known about the effects that increased use of technology is having on school communities, in particular, on the sense of community of classroom learners. Sense of Community The concept of community has received considerable interest in recent years in the United Sates, and related research has increased.

Despite concerns of some community psychologists over the erosion of the sense of community, and 371 its description by Sarason (as cited in Lounsbury & DeNeui, 1996) as the " overarching value" of community psychology, it was not until the mid-1980s that McMillan and Chavis (1986) proposed an operational definition of community. Their definition describes community as (a) a feeling that members have of belonging, (b) a feeling that members matter to one another and to the group, and (c) a shared faith that members' needs will be met through their commitment to be together.

Hill (1996) concluded that psychological sense of community refers to variables beyond individual relationships, that it appears to be setting specific, and that aspects of the concept differ from setting to setting. One such setting is the classroom. The sense of community among the students within a classroom is important. The construct is related closely to research by Glynn (1981) and Royal and Rossi (1997), who argued that common goals and values are essential elements of community, and by Strike (2004), who theorized that normation (i. e. the willingness of students to internalize group-shared expectations), is an important aspect of a learning community. Learning is assisted if students believe that they belong to the community or group that makes up a class and if they contribute to, and benefit from, that

classroom community. Interpersonal relationships also are enormously important in a community of learners. The less a person understands the feelings and behaviors of others, the more likely he or she will act inappropriately or insecurely and fail to gain acceptance within the community (Gardner, 1983).

Cooperative learning is an important component of the sense of classroom community. Johnson and Johnson (1992), Kagan (1994), and Slavin (1991, 1995) contributed to a considerable body of research that supports the benefits of cooperative learning. In addition, Sharan and Sharan (1992) reported that cooperative learning is an important aspect of the constructivist psychology of how students acquire Address correspondence to Mervyn J.

Wighting, Regent University, 1000 Regent University Drive, Virginia Beach, VA 23464-9800. (Email:edu) Copyright © 2006 Heldref Publications 372 The Journal of Educational Research knowledge. Constructivist cognitive psychology maintains that children actively construct their own notions of reality from their experiences. Wilson and Lowry (2000) maintained that learners need to develop individual competence, but in a context of effective participation within groups and learning communities.

Computer Use in Secondary Education The literature is not definitive concerning the effects of computer technology on student achievement, but there are indications that using technology may have a positive effect. In a meta-analysis, Waxman, Lin, and Michko (2003) studied the effects of

teaching and learning with technology on student outcomes with statistical data from 42 research studies. The results suggest that technology has a small, positive significant effect on student outcomes when compared with traditional instruction.

Findings gathered from 26 studies on the implementation of K–12 classroom networks with handheld devices connected to the teacher's laptop computer and integrated with a shared screen (Roschelle, Penuel, & Abrahamson, 2004) showed (a) greater student engagement, (b) increased student understanding of complex subject matter, and (c) increased student interest and enjoyment. Much of the literature, however, documents specific aspects or types of technology; the research base has not provided an assessment of how to integrate and use technology in schools and classrooms.

The tremendous pace of change in computer technology hinders such assessment as software and hardware developments are introduced in rapid succession before their effectiveness has been evaluated (Allen, 2001). Effects of Technology on Classroom Community Relatively few researchers report on the effects of technology on classroom community. Maddux, Johnson, and Willis (1997) argued strongly for the introduction of constructivist learning theories into classrooms through the use of technology but were unable to cite empirical findings from research to support their case.

In a meta-analysis across 23 studies, Susman (1998), who reported on cooperative learning by students working together, found a significant difference favoring cooperative learning with technology. Although some

empirical research supports the use of technology, an opposing school of thought contends that using technology in the classroom may have a negative effect on the sense of classroom community. Healy (1998) cautioned that children's spending too much time in front of a computer could lead to long-term psychological or physical problems.

Hiltz (1998) added that one of the potential negative effects of using technology in the classroom is a loss of social relationships and a loss of the sense of community. She also argued that collaborative-learning strategies are as important for computer-based teaching as they are for traditional classroom courses. Roblyer and Edwards (2000) noted that research results to date have not made a strong case for the impact of technology on the sense of community in the classroom.

The researchers offered a wealth of ideas and suggestions for ways in which they believed that technology can benefit teaching and recommended that more research is needed in newer technology uses, particularly those linked to constructivist theory or reflected in instructional practice. Purpose Researchers have examined the sense of classroom community among undergraduate student populations (Rovai & Lucking, 2000). The authors provided evidence that supports the theoretical basis of classroom community and found that it could be reliably measured.

In subsequent studies (e. g. , Rovai & Grooms, 2004; Rovai & Lucking, 2003), researchers have explored the sense of classroom community among members of graduate-level distance learning and face-to-face courses. The literature does not address sense of classroom community among K–12

students or whether their sense of learning in a classroom community is affected by the use of technology in instruction. I attempted to add to that body of knowledge by addressing the following research questions: 1.

How do high school students describe classroom community and its importance for their learning, and what factors do students perceive to be important for developing a sense of classroom community? 2. How does the use of technology in their classrooms affect students' sense of learning in a classroom community? Method Participants A nonrandom sample of 181 students from intact classes volunteered to participate in the present study. Ninety-one students were in Grade 9, and 90 students were in Grade 11; 89 students were boys, and 92 students were girls. Ninety-nine percent of the participants were volunteers.

The participants were enrolled in a variety of subject classes within the school curriculum; average class size was 16 students. The principal selected 12 teachers to participate, some of whom used computers frequently in their teaching, and others who did not. The principal determined teachers' high- or low-technology use by means of information compiled from professional evaluations, discussions with department chairs, and personal classroom observations. I determined equivalency of the groups regarding students' achievement prior to the study, and I considered equivalency in terms of student ethnicity.

Setting The participants comprised students from an urban independent high school in Virginia. Students who attended July/August 2006 [Vol. 99(No. 6)] 373 the school were assessed on entry as being of average or above-

average ability; part of the school's mission was to prepare them for admission to college. Students were drawn from a variety of socioeconomic backgrounds. Some students came from wealthy families; other students attended the school through a scholarship program. The majority of the students lived in urban neighborhoods; approximately 70% of them lived in the same urban area as the school.

The student population was diverse and included international students, as well as representatives from various American cultures and backgrounds. Instrument The participants responded to a prestudy measurement of their attitude toward computers. The Computer Attitude Questionnaire developed by Todman and File (1990) was the standardized instrument used for high school students. The scale shows an acceptable level of reliability. The authors reported that the internal consistency index (coefficient alpha) for the 20-item scale was . 82, according to the responses from 364 participants.

Todman and File reported that the instrument's concurrent validity was considered in a small-scale study in which it was administered to a group of 33 undergraduates immediately following completion of a questionnaire designed specifically for college students. The correlation between scores on the two scales was . 85. I used the Sense of Classroom Community Index (SCCI) developed by Rovai, Lucking, and Cristol (2001) to evaluate the sense of classroom community and its component dimensions of spirit, trust, interaction and learning. The questionnaire contains 40 items, with 10 questions for each of the four subscales.

Participants are asked to rate the extent to which they agree with each item on a 5-point, Likert-type scale, ranging from 1 (strongly agree) to 5 (strongly disagree). Rovai and colleagues designed the instrument for use by a wide population, ranging from middle school students to college undergraduates. In describing the SCCI's reliability, Rovai and colleagues (2001) reported Cronbach's coefficient alpha as . 96 for the overall SCCI score, . 90 for the spirit subscore, . 84 for the trust subscore, . 84 for the interaction subscore, and . 88 for the learning subscore.

In the present study (N = 181), coefficients of internal consistency were . 95 for the overall SCCI score, . 86 for the spirit subscore, . 80 for the trust subscore, . 82 for the interaction subscore, and . 87 for the learning subscore. Those findings provide evidence that classroom community and each of its dimensions have high internal consistencies and can be reliably measured with the SCCI. Rovai and colleagues also reported that the instrument possesses high face validity. The survey items are worded suitably for use with the target population, having a Flesch (1994) Reading Ease score of 81. on a 100-point scale (the higher the score, the easier to understand). To collect qualitative data, I used semistructured interviews with follow-up questions to probe for additional information. I assessed the reliability of each interview question initially by conducting a pilot study in advance of the actual interviews with a sample of students from Grade 8 (n = 20) and Grade 10 (n = 21). I conducted the pilot study to determine whether the questions were explicit and to show whether the questions were easily and fully understood by a sample of students who were similar to the participants.

I determined content validity by ensuring that the interview questions were constructed around the content domain of the SCCI and the use of technology in the classroom. Procedures I selected the intact classes of participants with criteria that related to their use of technology. I measured equivalency among the classes with school achievement records. I also determined the equivalency of the participants in terms of age and ethnicity. I distributed the Computer Attitude Questionnaire (Todman & File, 1990) as a further determinant of equivalency and supervised the SCCI o measure the sense of classroom community. Following the quantitative data analysis, I selected participants for the qualitative phase of the study. I made the selection equitably from within Grades 9 and 11 by purposeful sampling, and specifically, by maximum variation sampling. I chose that particular sampling technique because any common patterns that emerged from a large variation would be of particular interest and value for one to capture the core experiences and central shared aspects. Design and Data Analysis I used a mixed-method design in this study.

I analyzed the data that had been collected to determine equivalency among classes with analyses of variance (ANOVAs). I conducted discriminant analyses on the data by using the SCCI to investigate the relationship of the instrument's subscales with the criterion variable of high- or low-computer use in teaching. I performed a content analysis on the qualitative data by examining topics, categories of topics, and patterns across questions. The analysis was iterative to ensure that possible differences in the interpretation of responses were explored.

I provided samples of the analyzed responses to an independent third party to assess them for reliability of scoring. In addition, a peer review provided an external check of the research process. Finally, participants received the data, analyses, interpretations, and conclusions so that they could comment on the accuracy and credibility of the account. Further details on quantitative and qualitative analysis procedures are reported in the Results section. 374 The Journal of Educational Research Results Quantitative Analysis In Tables 1–3, the class designation indicates grade level (i. e. 9 or 11), followed by an identification letter relating to computer use in teaching. In both grade levels, classes with suffixes A–C are those with high levels of computer use in their instruction; suffixes X–Z denote those classes experiencing little or no technology in their teaching. I used an alpha level of . 05 for all statistical tests. I used standardized test scores to determine whether academic achievement equivalency existed among the groups of students. I used the Selection Index scores of the Preliminary Scholastic Achievement Test (PSAT), a national standardized test administered annually in the majority of high schools.

The Selection Index is the composite score of the two principal sections of the PSAT, mathematics and English, and has a maximum value of 240. Table 1 shows the descriptive statistics relating to level of achievement for all participating classes. I used inferential statistics to determine whether any significant differences existed among the achievement scores of classes in Grade 9. Levene's test showed that the assumption of homogeneity of variance was tenable, and the Kolmogorov-Smirnov test showed that normality was tenable.

ANOVA showed no significant differences among the

TABLE 1. Mean Standardized Achievement Test Scores

Grade	9(A)	9(B)	9(C)	Total	9(X)	9(Y)	9(Z)	Total	11(A)	11(B)	11(C)	Total	11(X)	11(Y)	11(Z)	Total
M	145.72	156.51	146.47	148.84	141.53	133.41	145.51	140.26	145.53	156.06	161.85	155.24	163.69	150.46	162.81	158.54
SD	15.71	23.33	17.64	18.77	21.77	15.87	18.58	19.16	19.73	21.57	22.61	21.67	13.64	23.26	24.36	20.48
Minimum	119	110	119	110	113	110	114	110	115	115	115	115	137	110	128	110
Maximum	181	190	180	190	193	170	190	193	193	190	211	211	187	189	203	203
n																

TABLE 2. Mean Standardized Computer Attitude Scores

Grade	9(A)	9(B)	9(C)	Total	9(X)	9(Y)	9(Z)	Total	11(A)	11(B)	11(C)	Total	11(X)	11(Y)	11(Z)	Total
M	56.44	56.25	53.81	55.51	57.13	57.93	56.73	57.17	50.73	56.88	52.11	53.19	50.94	58.15	53.31	53.95
SD	11.56	6.97	16.52	12.33	11.98	8.88	8.33	9.62	9.58	7.74	8.69	8.89	8.53	6.47	9.23	8.49
Minimum	23	43	13	13	40	46	44	40	28	43	36	28	36	49	37	36
Maximum	72	69	74	74	76	78	71	78	62	68	64	68	69	70	63	70
n	18	12	15	45	15	15	16	46	15	16	20	51	16	13	10	39

Note.

A, B, and C indicate high levels of computer use; X, Y, and Z indicate little or no computer use. Maximum possible score on the instrument is 80.

TABLE 3. Mean Classroom Community Index (SCCI) Scores

Grade	9(A)	9(B)	9(C)	Total	9(X)	9(Y)	9(Z)	Total	11(A)	11(B)	11(C)	Total	11(X)	11(Y)	11(Z)	Total
n	18	12	15	45	15	15	16	46	15	16	20	51	16	13	10	39
M	110.28	98.67	101.81	104.36	106.93	95.01	75.88	92.24	112.07	83.75	114.55	104.16	99.75	96.54	121.71	104.31
SD	19.75	17.15	18.51	18.93	20.55	19.59	23.82	24.69	16.96	22.25	19.06	23.71	20.95	20.5	20.27	21.81
Minimum	77	78	73	73												

55 63 34 34 92 36 73 36 57 57 85 57 Maximum 148 137 143 148 142 129 118 142 151 128 154 154 135 135 147 147 n 18 12 15 45 15 15 16 46 15 16 20 51 16 13 10 39 Note. A, B, and C indicate high levels of computer use; X, Y, and Z indicate little or no computer use. Maximum possible score for the Selection Index of the Preliminary Scholastic Achievement Test is 240. Note. A, B, and C indicate high levels of computer use; X, Y, and Z indicate little or no computer use. Maximum possible score obtainable on the SCCI is 160.

July/August 2006 [Vol. 99(No. 6)] 375 classes in terms of their achievement scores, $F(5, 85) = 2. 18$, $p = . 06$. I applied the same statistical process to the achievement scores of classes in Grade 11 and found no significant difference among the classes, $F(5, 84) = 2. 04$, $p = . 19$. The results indicate that the students in the various classes did not differ significantly in terms of their academic achievement level. I also analyzed the data to determine whether any significant differences existed among the ages of students in either grade.

ANOVA showed no significant differences among the classes from Grade 9, $F(5, 85) = 1. 40$, $p = . 23$, nor among participants in Grade 11, $F(5, 84) = . 87$, $p = . 53$. Participants also were similar with respect to diversity. I selected all the intact classes from within Grades 9 and 11, and no class differed significantly from another in terms of diversity among its students. I used standardized survey scores to determine equivalency among the groups of participants in terms of their attitude toward the use of computers. I obtained the scores from the Computer Attitude Questionnaire (Todman & File, 1990).

Cronbach's alpha applied to the attitude scores provided a coefficient of internal consistency of . 86 for the overall score, indicating a satisfactory level of reliability. Table 2 shows the descriptive statistics relating to participants' attitudes toward computers and the data obtained from all students. I analyzed the attitude scores to determine whether there were any significant differences among the classes in both grades. One-way ANOVAs showed that no significant differences existed among the classes in Grade 9, $F(5, 85) = . 29$, $p = . 5$, nor in Grade 11, $F(5, 84) = 2. 19$, $p = . 06$. I conducted descriptive analyses on the scores obtained on the SCCI and presented them in Table 3. The table shows that classes designated 9X–Z (low technology) had the lowest mean total score on the SCCI and that the mean totals for the other classes were similar to one another. The standard deviations show that the classes had similar levels of variability. Box plots revealed that the distributions were approximately normal. I conducted discriminant analyses on the data by using the stepwise procedure.

The first two-group discriminant analysis considered the predictor variables of the subscales of the SCCI and their relationship with the criterion variable of computer use in teaching (high or low). The stepwise analysis terminated at Step 1 and yielded an index of discrimination ($R = . 18$), Wilks's lambda ($1, 1, 179) = . 97$, $F(1, 179) = 5. 99$, $p = . 015$. I removed the subscales spirit, trust, and interaction from the analysis; the learning subscale remained. The analysis showed that 56. 4% of original grouped cases were classified correctly.

An independent samples t test examined the independent variable of high- and low-technology use in teaching and its effect on the learning subscale of

the SCCI. Levene's test for equality of variances revealed that the variances were significantly different. Students who used computers often in their classes scored higher on the learning subscale (M = 28. 30, SD = 5. 84) than did students who used computers less often in their classes (M = 25. 93, SD = 7. 18; effect size: d = . 36). The independent samples t test result was t(162) = 2. 42, p = . 02.

Analysis of the individual subscales of the SCCI, therefore, revealed that a significant difference existed between highand low-computer use in teaching, as measured by the learning subscale. To investigate student reactions to the subscale showing significant differences identified by inferential statistics, I examined responses to individual items within the learning domain of the SCCI. I conducted a descriptive analysis of the mean scores of the subscale and identified items that revealed a mean difference of ; 0. 3. I also identified four items with mean differences of ; 0. 3 from within the learning subscale and ategorized them according to technology level: 24. I feel that this course provides valuable skills. 28. I feel that there is no need to think critically in this course. 32. I feel that this course does not meet my educational needs. 36. I feel that I learn a lot in this course. The responses to questions from the learning domain suggest that students from the high-technology classes recognized that they were learning valuable new skills and that they were being encouraged to think critically. Those students also responded positively to the item asking whether their educational needs were being met.

Examination of the differences in means also indicated that a greater number of students from the high-technology classes, rather than those from

low-technology classes, considered that they were acquiring much knowledge from their particular class. Qualitative Analysis Table 4 shows the format of the semistructured interviews. Table 5 shows responses to questions based principally on use of technology in teaching, with responses by classes X–Z (low technology) in parentheses. Students (37%) responded that computers helped them with project work. One student commented that They are very helpful.

I've used a computer for every single project I've done in this class. Doing a package of work for one topic was so easy when I used the computer. All the information was right there, and it was very easy to understand. Other responses indicated that students (31%) enjoyed using technology in their work at school. A ninth-grade student observed that technology was helpful and fun, relating that We did a research project on exotic pets like monkeys and tigers, and had to find out what their needs were if they were kept as a pet. I found a great web site and got lots of stuff from it. I enjoyed doing it that way. 76 The Journal of Educational Research TABLE 4. Student Interview Questions Item no. Question computers is cool because it allows the student to find out things the teacher didn't know. The technology allows me to share new ideas with the teacher, so it's good for both of us. " Commenting on the use of technology in a social studies class, a student in a Grade 11 class revealed that It's pretty neat. We did the Spanish-American war just from computers—nothing came from a book. I went to a lot of Internet sites, and it stuck with me much better than if I had learned from a textbook.

It's easier really than having to go through the books to find out information. It's a different way of learning. Our teacher gave us some good information

off the web too that she had found and wanted to share with us. 1. Please describe your classroom interactions with other students in your ___ class. 2. Please explain how groups work together in this class. 3. Describe your sense of belonging to this class. 4. In what ways do you think you help other students learn in this class? 5. In what ways do you think other students help you to learn in this class? 6. How does trust play a role in the learning that takes place in this class? . Describe what it is like using computers to learn in this subject. 8. How does using computers in this class affect the way you work with other students? 9. How does using computers in this class affect the way you work with the teacher? 10. How much do you think you learn in this class compared with other classes? 11. How does the use of computers affect your sense of belonging? 12. How does using computers affect your sense of trust in this class? Table 6 shows responses to the questions related to the learning subscale of the SCCI, with classes X–Z shown in parentheses.

Students (35%) believed that there was a balance between the amount of help that they gave to their peers and that they received from others. I recorded the importance of questions raised by other students (34%) in class on several occasions. One example was We all sort of feed off one another. There are lots of questions asked. It's a very open class. I think the questions that I ask sometimes help other students to learn more vocabulary and to understand more of what we are learning. Another reply described a class where the sense of belonging to a community of learners was not present: I don't think other students help me much.

Questions are rare; there just isn't any opportunity. The slides just go up on the overhead and we have to take it all down. We don't learn too much. I

don't think I have learned anything much in the last month. TABLE 5. Students' Most Frequent Responses to Interview Questions (Technology) Item/category 1. Describe using computers to learn. They help me do project work. I enjoy using them. We only use them as word processors. 2. How do computers affect the way you work with other students? Makes little difference. We share information and web sites. 3. How do computers affect the way you work with the teacher?

Makes little difference. They help me work with the teacher. We share information and web sites. 3. How do computers affect the way you work with the teacher? Makes little difference. They help me work with the teacher. n % 8 (2) 6 (2) 3(2) 37 31 14 9 (6) 3 (1) 51 24 8 (5) 4 (1) 3 (1) 54 33 24 8 (5) 4 (1) 54 33 Note. n in parentheses denotes the number of students from lowtechnology classes. Some students (54%) believed that computers did not affect the way that they worked with their teacher; others (33%) indicated that they felt computers helped them work with a teacher. One student commented that " Using

Other responses (24%) pertained to the value of class discussions. A student answered: " We have a lot of class discussions—they help a lot. We are encouraged to argue and to say different points of view. " Responses varied regarding the amount that students believed they were learning in any particular class. Some students (42%) believed that they learned the most from a particular class. One student commented that " I learn a lot more in this class. I feel we are constantly learning a lot of new things. It's a good learning environment. " Another student responded, " This is one I really learn a lot in.

You just sort of retain the knowledge. " Other students (38%) indicated a particular class in which they learned the least. One student replied, " I learn more in most other classes. I find this more difficult, and most of the time I just don't get it. It seems to go right over my head, and my teacher doesn't seem to know that. " The responses show that a principal factor identified by students concerning classroom community and its importance for learning was use of computers. In addition to reporting that computers were important to their learning, students indicated that they enjoyed using them.

Another major factor for students was the sense of belonging to a class and experiencing a spirit of connectedness with their peers. Also important was students' trust among their peers and trust toward and from their teachers. July/August 2006 [Vol. 99(No. 6)] 377 TABLE 6. Students' Most Frequent Responses to Interview Questions (Learning Subscale) Item/category 1. How do you help other students learn? The questions I ask help others. I help others from home by phone or e-mail. The teacher asks me to explain. I do not help others much. 2. How do other students help you learn? The questions they ask help me.

Discussions generate different ideas. They help me from their home by phone or e-mail. They do not help me much. 3. How much do you learn compared with other classes? This is the one I learn most in. Far less. A lot more. n % 5 (3) 5 (2) 2 (1) 2 (2) 8 (3) 6 (2) 3 (2) 2 (1) 35 35 12 12 34 24 18 12 5 (4) 4 (2) 3 (1) 42 38 14 Note. n in parentheses denotes the number of students from lowtechnology classes. Discussion The results indicate that a sense of classroom community was present among the participants and

suggest that some students were aware of a feeling of community and may have benefited from it.

The data contained in this study build on previous research (e. g. , Rovai & Grooms, 2004; Rovai & Lucking, 2003) on the sense of community using the SCCI to measure students' beliefs. Many of the participants indicated that community was important to them and helped them in the learning process. That finding upholds the theory that social support and a sense of belonging are distinct aspects of the concept of community held by adolescents (Pretty, Conroy, Dugay, Fowler, & Williams, 1996).

The positive response to the concept of community identified among the adolescents in this study is not in accord with those who have expressed the opinion that a sense of community may be declining in this country (Newborough & Chavis, 1986; Schuler, 1996). The first research question asked how students describe classroom community, and its importance for their learning. My analyses revealed that students identified three main factors that were important to them concerning sense of community and its importance for their learning. The first factor was technology and the use of computers.

Students who were interviewed revealed that not only did they find computers helpful for assignments such as research projects but also they enjoyed using them for that purpose. The evidence, derived from qualitative analysis, supports the quantitative data suggesting that students experiencing high computer use in class responded more favorably than did students with low computer use to questions contained in the spirit and

learning domains of the SCCI. That finding adds support to previous studies that have reported students' favorable reactions to using technology in the classroom (e. g. Siegle & Foster, 2000; Combs, 2000; Waxman, Lin, & Michko, 2003), and has clear practical implications for classroom practices. If students enjoy using computers in their lessons, as well as recognize their value, motivation for learning may increase. Technology should not be viewed as an end in itself but as a tool to augment the sense of classroom community. Teachers should be encouraged to use computers to simplify, facilitate, and enhance individualized and social-learning processes. The second factor that was important to students was a sense of belonging to the class, a feeling of being wanted and liked by their peers.

The evidence adds to earlier work on the importance of classroom cohesiveness to students (Chin, Salisbury, & Gopal, 1996). Students indicated that they valued an atmosphere of teamwork in the classroom and could appreciate the concept of sharing elements of a task to complete a project collaboratively. Those responses indicate that the students experienced and commented on the value of collaborative learning in the context of describing the importance of classroom community. The third factor that was important to students' sense of community and to their learning was the amount of trust that they experienced in the classroom.

The qualitative findings are supported by descriptive quantitative results, as shown in the mean subscale scores for interaction and trust for students in Grades 9 and 11. Students viewed equally the level of trust among their peers and between themselves and their teacher. That finding provides evidence supporting McMillan's (1996) decision to include the dimension of

trust in place of influence in studies of community. My finding also supports Goleman's (1995) research, which stated that trust is necessary for true acceptance and complete membership of a community.

In addition, my finding adds to those of Rovai and Lucking (2003), who studied sense of community in a higher education, television-based distance education program, and found that distance students (a) felt less trust in their community of learners, (b) scored lower on the SCCI, and (c) expressed less certainty about the value of the course than did students in a conventional face-to-face class. Results of the present study suggest that students recognize the value of a sense of community and its inherent spirit of cooperation within a classroom.

The second research question asked how the use of technology in the classroom affects students' sense of learning in a classroom community. The learning subscale of the SCCI showed a significant increase among students who were being taught with a high amount of technology. Students from high-technology classes answered every item within the learning subscale of the instrument more positively than did students who experienced little or no computer use in their classes. That supporting evidence could 378 The Journal of Educational Research have important ramifications.

Use of technology in schools is continuing to increase, yet, little is known about its effect on students' sense of classroom community. Maddux and colleagues (1997) and Yaverbaum and Ocker (1998) argued for the introduction of constructivist approaches to learning through the use of computers by noting the paucity of research in this area. My findings suggest

that the learning subscale of the sense of classroom community may be influenced favorably if teachers use computers more frequently, thereby adding to the body of knowledge concerning the effects of technology on children's knowledge acquisition.

The findings support the views of Morrison, Lowther, and DeMeulle (1999) that technology use in the classroom and a constructivist approach to education are very compatible. The results also support the theory that students favor an element of learner control (Relan, 1992), which they can achieve through the use of technology. The responses by some students to interview questions indicate that they favored being allowed to explore the Internet to research a project. Students explained that they believed that they had more control over their learning with a computer than they did through the use of books.

The results suggest that students considered that they were learning together in a community and building on information that they acquired either individually or as a class. Limitations I had no control over teacher selection or amount or type of computer use in the intact classes during the study. Consequently, it was difficult to define accurately the independent variable of high- or low-computer use. Also, individual teaching style, as well as the personality of each teacher, might have had an effect on the sense of students' classroom community.

Teacher effect could have influenced any or all of the subscales of the SCCI, and this might be considered a confounding variable. The self-report nature of the questionnaires and interviews that I used in this study add another

possible limitation. Participants in research studies involving self-report instruments are often reluctant to report negative experiences. The results of this research can be generalized only to a similar population of students. The participants attended an urban independent school, and the results may not apply fully to students from other high schools or in schools located in different environments.

Conclusions Researchers can build on the present study by monitoring more closely the amount of, and type of, computer use. Further study into the effects of technology on students' sense of classroom community should use intact groups in a mixed design but employ ethnographic techniques to supplement the data collection methods used in this study. Researchers could investigate whether a high sense of classroom community is related to academic achievement and whether an interaction occurs with the use of technology.

I showed that the learning subscale of classroom community can be affected by the amount of technology that teachers use for classroom instruction. I also provided evidence that students enjoy using computers in a learning situation. The implications of this study for administrators and teachers are twofold. First, the use of computers may add to students' motivation and enjoyment of working within a community of learners. High school administrators should encourage all teachers to use computers as an integral part of their instruction.

Second, classroom community is important and could be linked to academic success. High school teachers may determine that sense of community data

add to their knowledge of individual students and to the manner in which these students work collaboratively.

REFERENCES Allen, R. (2001). Technology and learning: How schools map routes to technology's promised land. ASCD Curriculum Update, 1–3, 6–8. Chin, W. W. , Salisbury, W. D. , & Gopal, A. (1996). Perceived cohesion in groups: A confirmatory factor analysis of the dimensions of belonging and morale. Retrieved August 9, 2005, from http://faculty. ob. ohiou. edu/ salisbury/research/cohesion. html Combs, K. A. (2000). Factors influencing the implementation of technology in a magnet high school. Unpublished doctoral dissertation, Baylor University. Flesch, R. (1949). The art of readable writing. New York: Harper. Gardner, H. (1983). Frames of mind: The theory of multiple intelligences. New York: BasicBooks. Glynn, T. (1981). Psychological sense of community: Measurement and application. Human Relations, 34, 789–791. Goleman, D. (1995). Emotional intelligence: Why it can matter more than IQ. New York: Bantam Books. Healy, J.

M. (1998). Failure to connect: How computers affect our children's minds— for better and worse (pp. 17–35). New York: Simon & Schuster. Hill, J. L. (1996). Psychological sense of community: Suggestions for future research. Journal of Community Psychology, 24, 431–438. Hiltz, S. R. (1998, November). Collaborative learning in asynchronous learning networks: Building learning communities. Paper presented at 1998 World Conference of WWW, Internet, and Internet Proceedings, Orlando, Florida. (ERIC Document Reproduction Service No. ED427705) Johnson, D. W. , & Johnson, R. T. (1992).

Encouraging thinking through constructive controversy. In N. Davidson, & T. Worsham (Eds.), Enhancing thinking through cooperative learning (pp. 120–137). New York: Teachers College Press. Kagan, S. (1994). Cooperative learning. San Clemente, CA: Kagan Cooperative Learning. Lounsbury, J. W. , & De Nieu, D. (1996). Collegiate psychological sense of community in relation to size of college/university and extroversion. Journal of Community Psychology, 24, 381–394. Maddux, C. M. , Johnson, D. L. , & Willis, J. W. (1997). Educational computing: Learning with tomorrow's technologies.

Boston: Allyn & Bacon. McMillan, D. W. (1996). Sense of community. Journal of Community Psychology, 24, 315–325. McMillan, D. W. , & Chavis, D. M. (1986). Sense of community: A definition and theory. Journal of Community Psychology, 14, 6–23. Morrison, G. R. , Lowther, D. L. , & DeMeulle, L. (1999). Integrating computer technology into the classroom. Upper Saddle River, NJ: Prentice-Hall. Newborough, J. R. , & Chavis, D. M. (1986). Psychological sense of community, 1: Foreword. Journal of Community Psychology, 14(1), 3–4. Pretty, G. M. , Conroy, C. , Dugay, J. , Fowler, K. , & Williams, D. (1996).

Sense of community and its relevance to adolescents of all ages. Journal of Community Psychology, 24, 365–379. Relan, A. (1992, February). Motivational strategies in computer-based instruction: Some lessons from theories and models of motivation. Proceed- July/August 2006 [Vol. 99(No. 6)] ings of selected research presentation at the 1992 Convention of the Association for Educational Communications and Technology. (ERIC Document Reproduction Service No ED348017) Roblyer, M. D. , & Edwards, J. (2000). Integrating educational technology into teaching. Upper Saddle River, NJ: Merrill. Roschelle, J. Penuel, W. R. , & Abrahamson, L. A. (2004).

The networked classroom. Educational Leadership, 61(5), 50–54. Rovai, A. P. , & Grooms, L. D. (2004). The relationship of personalitybased learning style preferences and learning among online graduate students. Journal of Computing in Higher Education, 16(1), 30–47. Rovai, A. P. , & Lucking, R. A. (2000, September). Measuring sense of classroom community. Paper presented to Learning 2000: Reassessing the virtual university, Roanoke, VA. Rovai, A. P. , & Lucking, R. A. (2003). Sense of community in a higher education television-based distance education program.

Educational Technology Research and Development, 51(2), 5–16. Rovai, A. P. , Lucking, R. A. , & Cristol, D. (2001). Sense of classroom community index. Unpublished manuscript, Regent University, Virginia Beach, VA. (Copyrighted instrument inquiries should be sent to:edu) Royal, M. A. , & Rossi, R. J. (1997). Schools as communities. Eugene, OR: ERIC Clearinghouse on Educational Management. (ERIC Document Reproduction Service No. ED405641) Schuler, D. (1996). New community networks: Wired for change (pp. 5–110). New York: Addison Wesley. Sharan, Y. , & Sharan, S. 1992). Expanding cooperative learning through group investigation. New York: Teachers College Press. 379 Siegle, D. , & Foster, T. (2000, April). Effects of laptop computers with multimedia and presentation software on student achievement. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED442465) Slavin, R. E. (1991). Synthesis of research on cooperative learning. Educational Leadership, 48, 71–82. Slavin, R. E. (1995). Cooperative learning. Boston: Allyn & Bacon. Strike, K. A. (2004).

Community, the missing element of school reform: Why schools should be more like congregations than banks. American Journal of Education, 110, 215–232. Susman, E. B. (1998). Cooperative learning: A review of factors that increase the effectiveness of cooperative computer-based instruction. Journal of Educational Computing Research, 18, 303–322. Todman, J. B. , & File, P. E. (1990). A scale for children's attitudes to computers. School Psychology International, 1, 71–75. Waxman, H. C. , Lin, M. F. , & Michko, G. M. (2003). A meta-analysis of the effectiveness of teaching and learning with technology on student outcomes.

Learning Point Associates. Retrieved November 15, 2004, from http://www. ncrel. org/tech/effects2 Wilson, B. , & Lowry, M. (2000). Constructivist learning on the web. New Directions for Adult and Continuing Education, 88, 79–88. Yaverbaum, G. L. , & Ocker, R. J. (1998, November). Problem solving in the virtual classroom: A study of student perceptions related to collaborative learning techniques. Paper presented at the 1998 World Conference of WWW, Internet, and Internet Proceedings, Orlando, Florida. (ERIC Document Reproduction Service No. ED427750)