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Connecting schools, community, and family with ICT: Four-year trends related to school level and SES of public schools in Florida

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ABSTRACT

Community and family involvement in schools is a well-documented antecedent to student success; yet, educators often find it challenging to increase involvement with parents and members of diverse communities. One solution is to use information and communication technology (ICT) as a bridge between schools, families, and the community. This research first presents a conceptual framework for uniting schools, families, and community members using ICT and then uses statewide data collected in Florida from the 2003–2004 to 2006–2007 school years to investigate significant trends in how schools communicate with, involve, and provide ICT access and education for community and family members. Results were analyzed at each school level, as well as by the differences between high and low socio-economic status (SES) schools. Findings indicate that during the study schools at every level and SES group significantly increased their contributions for ICT access and education of families and communities. However, high schools serving the most economically advantaged students provided the most ICT contributions to their families and communities. On the other hand, in support of bridging the digital divide, low SES elementary and middle schools provided significantly more contributions for ICT access and education of their community and parents, than their high SES counterparts. Recommendations and implications are provided.

1. Introduction

After the release of the seminal Coleman Report, *The Equality of Educational Opportunity* (Coleman et al., 1966), the relationship between home, community, and school factors with student achievement has been investigated by many researchers. Findings indicate that parental involvement in schools positively impacts student achievement, reduces student absenteeism, increases graduation rates, improves student attitudes and behavior, and increases student enrollment in secondary education (Desforges & Abouchaar, 2003; Henderson & Berla, 1994; Hoover-Dempsey & Sandler, 1997; Hoover-Dempsey et al., 2005). In addition, community involvement in schools has been reported to improve student achievement, decrease delinquency, and improve overall student behavior (Epstein, 2005a; Ofsted, 2007; Sheldon, 2003; Sheldon & Epstein, 2002). Recent studies also suggest that the form of community and parent involvement with the school can have differential effects according to the families' social capital and socio-economic status (SES) (Lee & Bowen, 2006; Woolley et al., 2008).

The value of increased community and parent involvement is a well-documented antecedent for successful education reform; however, educators find it especially challenging to increase involvement with parents and members of diverse communities (Epstein & Sanders, 2006; Howland, Anderson, Smiley, & Abbott, 2006). One solution may be the effective use of information and communication technology (ICT) to increase family and community involvement (Becta, 2008; Shaw & Shaw, 1999). However, few studies have examined how ICT can be used to increase and sustain community and parent involvement (Clark, 2005; Shaw & Shaw, 1999). This paper aims at establishing the role of ICT in connecting schools, families, and communities within a conceptual framework; then it uses the framework to examine the trends in ICT policy and use by public schools in Florida.

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2. Conceptual framework and previous literature

2.1. Establishing the role of ICT in family and community involvement

Bronfenbrenner (1986) proposed an ecological model for explaining the context of human development. He explains that mesosystems, which directly impact the child (e.g., the family, peers, neighbors, and school), and exosystems, which indirectly impact the child (e.g., parent's employment and social network), can exert either positive or negative influences on the dynamics of family interactions. In addition, Coleman (1987) explains that the social capital of a family is determined by its ability to access beneficial external factors (e.g., the employment and training opportunities provided by businesses in the neighborhood and supportive interactions provided by the extended family and members in community organizations, schools, and churches). Having social capital can positively influence the development of children; while not having social capital can negatively influence the development of children. He further proposes that these external factors are dynamic in that the relationships among schools, families, and community are reciprocal. Several researchers have specifically examined the complex relationships among community, schools, and families in order to enhance the education of children (Epstein, 2001; Lee & Bowen, 2006; Nettles, 1991; Sanders, 2003; Woolley et al., 2008). Children and families in low SES neighborhoods are often found to have the least social capital (Coleman, 1987; Coleman et al., 1966; Henderson & Berla, 1994; Lee & Bowen, 2006; Nettles, 1991; Woolley et al., 2008). Therefore, it is important to examine differences in the interactions of schools, communities, and families based on the socio-economic status (SES) of the school and the influence of these interactions in promoting social capital or positive outcomes.

Epstein (2001) uses the *Spheres of Influence* framework to explain the dynamics of the relationships among families, community members, and schools (see Fig. 1). The overlap of the *Spheres of Influence* is based upon the nature and degree of the communication and collaboration among the spheres. This conceptual framework posits that student learning and development are enhanced with greater interactions among the spheres. High involvement in which there are many interactions results in the highest levels of positive outcomes for students (Epstein et al., 2002).

As noted by Epstein et al. (2002), the interactions between schools and the other *Spheres of Influence* may be studied at an institutional level (i.e., policies, strategies, and practices employed by schools to involve families and community members). When schools can implement effective communications and supports for interactions with families and community members, high involvement can be obtained, which is linked to positive student outcomes (Epstein et al., 2002; Howland et al., 2006). Therefore, effective methods of increasing community and parent involvement are key areas of concern for educators (Epstein, 2005b; Epstein & Sanders, 2006).

Nettles (1991) conceptualized the interactions between communities and schools as steps in the change process, including: conversion, mobilization, allocation of resources, and instruction. Conversion deals with changes in beliefs or an openness to new ideas and behaviors through communication. Sustained and open communication among stakeholders is essential for conversion to take place. Because the word conversion has connotations of authority, the authors believe open communications is a better descriptor of this concept. Mobilization refers to the actions that increase the participation of families and community members in the educational process. Allocation refers to the provision of resources by both the community entities and schools. Finally, instruction embraces actions designed to assist students and community members in their learning and development.

By connecting the change processes proposed by Nettles (1991) to the *Spheres of Influence* proposed by Epstein (2001) and delineating the application of ICT, the interactions among school, community, and family supported by ICT can be outlined. Each of these interactions with ICT increases the students' and the families' social capital, which leads toward positive outcomes for students, families, and communities. Examples of ICT uses are shown in Table 1 by change process. Schools can increase open communication with families and community members through ICT methods, such as email, blogs, podcasts, school websites, and on-line databases, as well as by using ICT for traditional modes of communication (e.g., newsletters, radio and televisions broadcasts, and PTA presentations). Likewise, schools can support mobilization by inviting family and community members to become involved in the school technology planning process (Ritzhaupt, Hohlfeld, Barron, & Kemker, 2008). Note that this table is not complete and focuses on those interactions that are related to this research.

Schools can allocate resources by allowing students to take home digital devices, thus providing family members with access to computers and software. Studies have linked access to home computers with increased achievement in language arts and mathematics (O'Dwyer et al., 2005, 2008; Organisation for Economic Co-Operation & Development, 2005; Valentine, Marsh, & Pattie, 2008). Conversely, community organizations can supply ICT resources to schools in the form of donations, and partnerships between schools and community

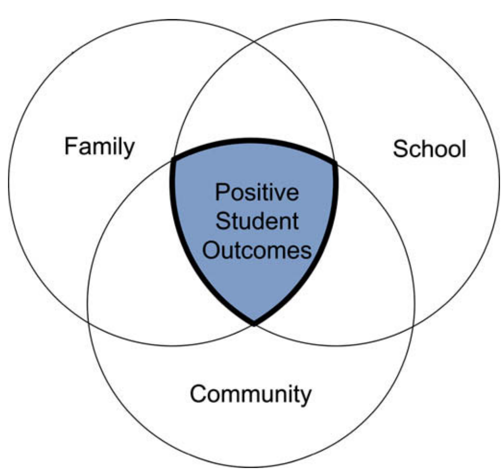

Fig. 1. Spheres of Influence framework (adapted from Epstein, 2001).

Table 1
ICT used by schools to increase interactions among spheres of Influence by change process.

Change process	ICT use
Open communication	• Use ICT methods to communicate information
Mobilization	• Involve parents and community in the ICT planning process
Allocation	• Establish technology access centers with community partners • Adopt policy for accepting donated computers • Allow access to ICT at school • Permit students to check out digital devices for home use
Instruction	• Increase family and community awareness of ICT • Allow access to ICT by families and community members at school • Offer hands-on technology training to families and community members • Permit students to check out digital devices for home use

organizations can establish off-campus technology access centers by providing ICT or human resources (Servon & Nelson, 2001). The sharing of school and community ICT resources may be the antecedent that activates the instructional process.

The final aspect of the change process is instruction. As noted by Nettles (1991), instruction can occur formally or informally. Schools can provide access to ICT resources (e.g., Internet access, digital library services, and general software) to both parents and members of the local community during school hours or after school hours. Computer labs may be opened for community and family members to participate in hands-on technology training sessions. Schools can support the ICT education of students and parents by allowing digital devices to be taken home. Using ICT to enhance the change process facilitates increased interactions that increase the overlap of the *Spheres of Influence* and thus promotes positive outcomes for students (see Fig. 2).

2.2. Bridging the digital divide

As schools use ICT to communicate and collaborate with families and community members, they have the opportunity to increase their social capital by simultaneously addressing the digital divide. The digital divide may be characterized as a lack of access, knowledge, and skills for students, families, and community members to use ICT for empowerment (Hohlfeld, Ritzhaupt, Barron, & Kemker, 2008). As noted, schools can provide access to ICT resources either on campus or by permitting students to checkout digital devices for use at home or within the community at large. Schools may be a critical component in developing community technology centers for empowering and educating economically disadvantaged communities (Servon & Nelson, 2001). Nevertheless, access does not necessarily equate with service (Alampay, 2006). Alampay (2006) explains the important difference between universal access and universal service. Universal access assures that basic ICT services are available within a community so that individuals, who find a need to utilize ICT services, have access to them, while universal service assures that basic ICT services are available within the homes in order to promote and facilitate families' participation in society. In this light, schools might play a role in bridging the gap in universal service as well as access, by also providing ICT awareness and training opportunities for family and community members to acquire the necessary ICT skills. Furthermore, Campbell (2001) proposes that although having access and gaining skills with ICT are important, the significance of the digital divide is with the disparity of outputs or use of ICT for disseminating and using information for educational and economic gains of individuals. Therefore, the roles that schools are performing in the development of ICT skills of families and community members are important functions to examine.

2.3. Background and purpose

Florida is a particularly interesting state within which to examine the differences in how schools use ICT to increase family and community involvement. Florida experienced over 21% growth in public school population between the 1994–1995 and 2004–2005 school

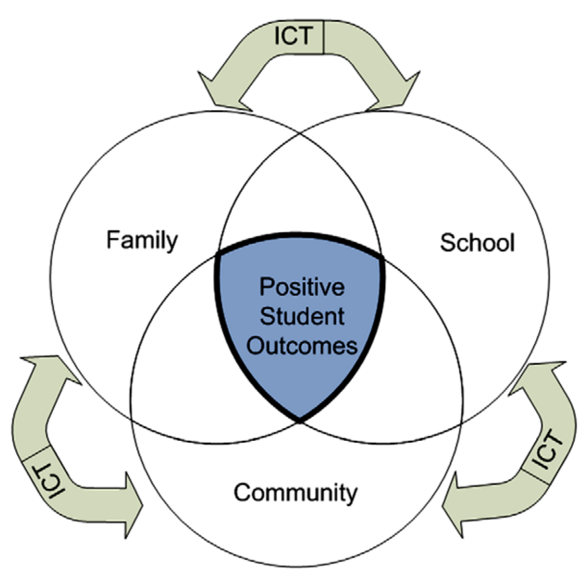

Fig. 2. Spheres of Influence framework (adapted from Epstein, 2001) with ICT supports.

years (Florida Department of Education, 2007a). In addition Florida has a high percentage of students eligible for free or reduced-price lunch (44.0% in 1994–1995 to 45.9% in 2005–2006) (Florida Department of Education, 2007a). Moreover, Florida is one of few states to collect annual longitudinal data (since 2003) about ICT access and use within schools.

The purpose of this research is to inform policy makers, parents, and educators about how ICT has been used to reach families and community members. Specifically, this research used statewide data collected from the 2003–2004 to 2006–2007 school years to investigate significant trends related to ICT supports for families and community members in high and low SES schools at each school level (elementary, middle, and high). Four research questions were investigated in this research:

1. Has the number of ICT methods that Florida K-12 schools use to communicate with community members and parents about the educational process increased at the same rate at each school level (elementary, middle, and high) and at high and low SES schools?
2. Have schools equitably mobilized community involvement in the educational process by increasing the number of community members who actively contribute to technology planning in schools?
   a. Have schools increased the numbers of community members who actively contribute to technology planning at each school level (elementary, middle, and high) at the same rate?
   b. Have schools increased the numbers of community members who actively contribute to technology planning at high and low SES schools at the same rate?
3. Are schools equally committed to sharing resources with the community at each school level and at high and low SES schools?
   a. Are schools using digital devices to increase family access to ICT hardware and information?
   b. Are schools using laptops to increase family access to ICT hardware and information?
   c. Do schools have a policy for donations of computers either from the community or donations of computers to the community?
4. Are schools equitably supporting the instruction and acquisition of technology skills of parents and community members by providing access to technology at school and home and by including parents and community members in training opportunities?

3. Method

3.1. Data sources

The data for the study were obtained from several on-line databases that are available to the public for research purposes by the Florida Department of Education (FLDOE).

3.1.1. Technology integration indicators

Each year, the FLDOE surveys every school in Florida about technology integration within their schools and community (Bureau of Instruction & Florida Department of Education, 2007a, 2007b; Florida Department of Education, 2007a). The *Florida Innovates* survey currently contains approximately 80 items and is organized into five sections: digital learning environment, instructional leadership, Florida digital educators, access to technology, and infrastructure and support. The principal and district technology coordinators from all schools within Florida's 67 school districts are asked to complete the survey. The response rate on the survey has been very high – 97% in 2003–2004 ($N = 2514$); 96% in 2004–2005 ($N = 2553$); 97% in 2005–2006 ($N = 2658$); and 96% in 2006–2007 ($N = 3189$) (Bureau of Instruction & Innovation, 2007a, 2007b; Florida Department of Education, 2007b). Items include radio buttons with 1–5 options and check boxes that allow the selection of all that apply. The sample was filtered to include all public elementary, middle, and high schools in Florida that participated in the *Florida Innovates* survey for all four years.

3.1.2. Demographic indicators

In order to obtain school demographic information, data about the percent of students with free and or reduced lunch status were obtained from the on-line Florida School Indicators (FSIR) Report (Florida Department of Education, 2007b). When this information was not available, the percent of economically disadvantaged students was obtained from the on-line Measuring Adequate Yearly Progress (AYP) reports (Division of Accountability, Research & Measurement, Florida Department of Education, 2007). The information from these databases was linked with the data from the *Florida Innovates* surveys using the school code number. In some of the analyses, SES was used as a continuous variable, and in other analyses, schools were placed in categories of low SES (most economically disadvantaged) and high SES (most economically advantaged).

3.2. Measurements

The following six items pertaining to community and parent technology access and awareness were selected from the *Florida Innovates* survey based on their appropriateness to address the research questions:

(1) Which of the following tools do you use when sharing information with your community? (Check all that apply)
(2) Who actively participates in the technology planning process?
(3) To what extent are students able to check out digital devices for off-campus use?
(4) Are laptop or tablet computers available for students to take home?
(5) Does your school have a policy for accepting donated computers?
(6) Which of the following contributions does your school technology program make to parents or the community? (Check all that apply.)

The first step in the analysis was to map the items across the four years to ensure consistency (see Appendix D). Exploratory factor analysis was conducted, but the factors extracted were not interpretable; therefore, variables used to measure constructs were grouped logically. Next composites were created from the responses to these items in order to measure the factors of interest. Next, the internal consistency reliability was calculated for the composites used to determine how well they measured the constructs.

To answer the first research question (has the number of ICT methods that Florida K-12 schools use to communicate with community members and parents about the educational process increased at the same rate at each school level (elementary, middle, and high) and at high and low SES schools?) the researchers chose to create a composite variable to measure the number of communication methods that schools used each year. Eight response options were selected from the item, which of the following tools do you use when sharing information with your community? (Check all that apply). The options included classroom websites, email, print media, radio broadcasting, school websites, telephone homework hotline, television broadcasting, and voice bulletins/voice mail. After 2003–2004 additional tools were added to the survey; however, in order to obtain trends for four years for the items that were consistent these additional tools were not used in this research. This change in the response options of the survey item and not including the additional options that were chosen by participants may have resulted in the lower than preferred internal consistence reliability of the scores for this composite. The lower internal consistency also indicates that in this sample there was great variability in the combination of communication tools, which were selected by different schools. The internal consistency reliability (K R-20) were .47, .48, .49, and .46 for the 2003–2004, 2004–2005, 2005–2006, and 2006–2007 school years, respectively.

To answer the second research question (Have schools equitably mobilized community involvement in the educational process by increasing the number of community members who actively contribute to technology planning in schools – (a) at each school level (elementary, middle, and high), and (b) at high and low SES schools?) a composite variable was created to measure the degree of representation of the community in the technology planning process (Lee & Bowen, 2006; Woolley et al., 2008). Five options that were consistent for three years were selected from the item Who actively participates in the technology planning process? The response options included the following roles: business leaders, consortia, community members, parents, and students. The composite variable for each year was created by adding all of the options checked, yielding the total number of community stakeholder representatives involved in the planning process. The internal consistency reliability coefficients (K R-20) were .75, .68, and .68 for the 2004–2005, 2005–2006, and 2006–2007 school years, respectively.

The third research question (*Are schools equally committed to sharing resources with the community at each school level and at high and low SES schools?*) was answered by analyzing three items separately. These items were included in the survey for different numbers of years. The responses to each of these items were dichotomized to form yes and no responses. The responses to the item available for all four years indicated if digital devices were available for checkout. In 2004–2005 a new item (*Are laptop or tablet computers available for students to take home*?) was added to the survey, yielding a three-year trend. Third, a new item (*Does your school have a policy for accepting donated computers?*) that was added to the *Florida Innovates* survey in 2005–2006 was used to examine a two-year trend.

To answer the fourth research question (Are schools equitably supporting the instruction and acquisition of technology skills of parents and community members by providing access to technology at school and home and by including parents and community members in training opportunities?), a composite variable was created using the options from two items. This composite measured the number of methods that schools used to support the instruction and acquisition of technology skills of parents and the community at school and home. The response options of the first item (Which of the following contributions does your school technology program make to parents or the community?) included we are making an effort to increase technology awareness, we offer access to technology at our school, we have partnered with our community to establish technology access centers in locations other than the school, and we offer hands-on technology training. The response options for the item (To what extent are students able to check out digital devices for off-campus use?) were dichotomized into one for Yes or zero for No in which Yes indicates there is some form of digital device checkout available for students. This provided a method for supporting ICT instruction and skills acquisition of parents at home. The number of yes responses for the five options used from both items were tallied to provide a count of methods used both within the school and at home to support the instruction and the acquisition of technology skills of parents and community members. The internal consistency reliability (K R-20) were .38, .41, .48, and .48 for the 2003–2004, 2004–2005, 2005–2006, and 2006–2007 school years, respectively. This low internal consistency may have resulted from dichotomizing the options of the one item and including it with the options of the second item. Once combined the options from these two items may not measure the desired construct, which was how well the school supports the instruction and acquisition of technology skills of parents and community members.

3.3. Data preparation and analysis

The data files were merged across years by school code. Elementary, middle, and high public schools that participated in all four years of the study were retained in the dataset. The data were examined for missing data and outliers. The percentage of students on free or reduced-priced lunch programs within each school was merged with these data and the datasets were separated by school level. When the SES variable was missing for a year, the mean of the other three years was used to impute a value. Then each level was rank-ordered by the percentage of students on free or reduced-priced lunch programs. The data at each school level (elementary, middle, and high) were subdivided into two groups of schools – schools (30%) with greatest proportions of students on free or reduced-priced lunch programs (low SES schools) and schools (30%) with the lowest proportions of students on free or reduced-priced lunch programs (high SES schools). Table 2 illustrates the number of schools each year by school level and SES group.

Two types of analyses were conducted; multi-level modeling to answer research questions that used continuous variables and logistic regression for categorical variables to answer the research question with dichotomous variables. First, multi-level modeling statistical analysis for growth curves was used to examine the relationships between the SES and school level and three composite continuous technology indicator variables (*tools used to communicate with families and the community; community stakeholders involved in the technology planning process; contributions to the technology education of families and community members*). Multi-level modeling allows the analysis of nested data when there are missing data points, thus using more of the collected data in the data analysis. For the analyses, SAS 9.1.3 statistical software was used with maximum likelihood estimation and alpha set at $\alpha = .05$ to determine significant differences.

Table 2
Number of schools by school level, socio-economic status, and year.

School level	SES level	2003–2004	2004–2005	2005–2006	2006–2007
Elementary	High	465	465	465	465
	Low	465	465	465	465
Middle	High	136	136	136	136
	Low	136	136	136	136
High school	High	107	107	107	107
	Low	107	107	107	107

Level 1
$$\text{Technology Integration Measure} = \beta_0 + \beta_1{*}\text{Time} + r$$

Level 2
$$\beta_0 = \gamma_{00} + \gamma_{01}{*}\text{SES} + \gamma_{02}{*}\text{School Level} + u_0$$
$$\beta_1 = \gamma_{10} + \gamma_{11}{*}\text{SES} + \gamma_{12}{*}\text{School Level} + u_1$$

Fig. 3. Multi-level model example equations.

Because the focus of this study was on the differences in trends for the different school levels and levels of SES, two sets of multi-level models were examined. The first set of equations for the unconditional model (a model with no predictors) determined the intraclass correlation coefficients (ICC) for both composite technology indicators. The ICC for the composite technology integration indicators were high (e.g., ICC = 0.38), indicating that the data were nested and multi-level modeling was the appropriate statistical analysis. The next set of equations included time as a continuous variable to determine if the slope was significant. After time was found to be significant, then $time^2$ was added to form the quadratic equation with time to determine if the trend was significantly curvilinear or U or mound shaped. However, the variance for $time^2$ was not significant, indicating that the trends were linear and not curvilinear. The variance of the slope for the technology indicators was significant; therefore, the variance of time or the slope was set as random. Next, a set of equations with time as a categorical variable was estimated. Contrasts were included for each point in time, each school level, and each socio-economic level to determine if there were significant differences at each point in time and between years from 2003–2004 to 2006–2007 for each school level (elementary, middle, and high) at high and low SES levels. *F*-statistics and *p*-values are reported to describe significant SES effects. An example multi-level equation is shown in Fig. 3. Middle schools served as the comparison school level.

The differences in sample percentages of each dichotomous technology indicator variable were tested using logistic models with repeated measures for categorical variables. This method was selected instead of using traditional Chi-Square because the same schools were compared over time, thus, requiring a repeated measures method for categorical data. Contrasts were run to determine if there were significant differences between years and SES groups.

4. Results

Interpretation of the results must be viewed within the limitations of this study. This study has been conducted using secondary data that were collected by the FLDOE. The state of technology hardware has undergone rapid change over the last four years. As a result, the design of the survey has been revised to collect relevant information needed for decision-making by school districts. Requirements for who answers the surveys as well as clarification and movement of the items within the survey may have impacted the responses. Additionally, some of the measures employed in this research exhibited lower than preferred internally consistent structures (K R 20 > 0.7). Finally, using the proportion of eligible students for free or reduced lunch status as the only proxy for SES may not accurately represent this population. The findings from the analysis for each of the research questions are presented in the following sections.

4.1. Tools used to communicate with families and communities

Research question 1: Has the number of ICT methods that Florida K-12 schools use to communicate with community members and parents about the educational process increased at the same rate at each school level (elementary, middle, and high) and at high and low SES schools?

Table 3
Mean number of ICT tools used to share information with community by school level, SES level and school year.

School level	SES level	2003–2004	2004–2005	2005–2006	2006–2007
All schools	All	3.87	4.09	4.31	4.45
Elementary	High	3.89	4.08	4.35	4.52
	Low	2.78	3.19	3.40	3.67
Middle	High	4.40	4.65	4.78	4.84
	Low	3.69	3.75	4.15	4.24
High school	High	4.22	4.78	4.84	5.02
	Low	3.88	3.92	4.27	4.42

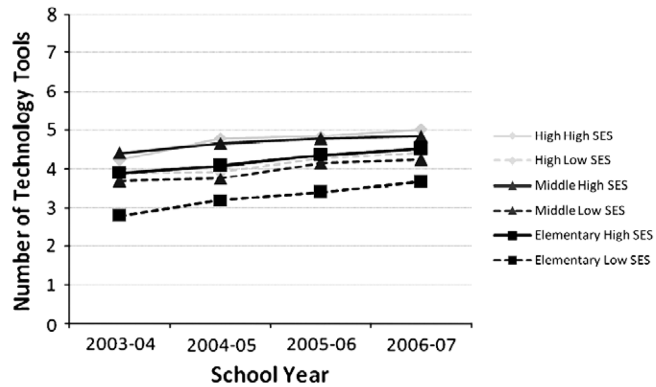

Fig. 4. Mean number of ICT tools used by schools to communicate with families and community members by schools level, SES level, and school year.

The changes over the four years of the study for the mean percentage of schools that use each individual technology tool by school level and SES level are depicted in Appendix A. As can be gleaned, schools use different methods of communication based on their SES level. Print media appears to be the most widely used method of communication, followed by school websites. Radio broadcasting, television, and hotlines were the least frequently used methods. Across the various forms of media, there are clear disparities between high and low SES schools, irrespective of school level.

Table 3 presents the mean number of ICT tools that the schools use at each school level, SES level, and school year. Through time, all schools at all SES levels increased the number of technology tools from 3.87 in 2003–2004 to 4.45 in 2006–2007. When the results are disaggregated by SES so that high and low SES schools can be compared, it is evident that, in all years at all levels, high SES schools used more technology tools for communicating than their low SES counterparts.

Fig. 4 further illustrates the disparity between high and low SES schools in the use of various ICT communication methods. Overall, high schools used the most ICT methods to communicate with families and communities, closely followed by middle schools.

In order to determine if these differences were significant, multi-level models were estimated to compare the differences in the means while controlling for school level and SES level. The BIC indices decreased from 31474.6 for the unconditional model to 30341.6 for the final model, and the deviance statistic decreased from 31451.3 to 30217.3; both indicating better model fit. Differences were significant ($X^2 = 1273.43$, $p < .0001$). Contrasts were run to find significant differences between high and low SES schools at each school level at each point of time (see Table 4). The results indicate that there were significant differences between high and low SES schools and the number of technology tools that they used to communicate with families and the community at elementary school level in 2003–2004, 2004–2005, and 2005–2006 school years. There were also significant differences at the high school level in 2004–2005 and 2006–2007 and middle schools in 2005–2006. During the most recent school year, high SES high schools were using significantly more tools to communicate with family and community members than low SES high schools, while there were no significant differences between the number of tools used by high and low SES elementary or middle schools.

To determine if there were significant trends, contrasts were run at each SES level for each level of school between each point in time (see Table 5). There were significant positive trends between every year for both high and low SES elementary schools, meaning elementary schools are increasing the number of ICT tools used by schools to share information with families and communities members. In addition, there were significant increasing trends between the beginning of the study in 2003–2004 and the end of the study in 2006–2007 for both high and low SES high schools. For high SES schools, this trend became significant between 2003–2004 and 2005–2006. There were no significant trends for middle schools.

4.2. Community members involved in technology planning process

Research question 2: Have schools equitably mobilized community involvement in the educational process by increasing the number of community members who actively contribute to technology planning in schools?

(a) Have schools increased the numbers of community members who actively contribute to technology planning at each school level (elementary, middle, and high) at the same rate?
(b) Have schools increased the numbers of community members who actively contribute to technology planning at high and low SES schools at the same rate.

Table 4
Contrasts between high and low SES schools for the number of ICT tools used to share information with families and community by school level.

School level	High SES vs. low SES (*F*-value)			
	2003–2004	2004–2005	2005–2006	2006–2007
Elementary	4.86*	20.45**	12.91**	3.12
Middle	3.53	1.89	5.51*	0.95
High	0.08	4.27*	3.04	6.02*

* $p < .05$.
** $p < .01$.

Table 5
Significant trends in the number of ICT tools used by schools to share information with families and community by school and SES.

School level	SES level	Contrasts between years *F*-value					
		2003–2004 vs. 2004–2005	2003–2004 vs. 2005–2006	2003–2004 vs. 2006–2007	2004–2005 vs. 2006–2007	2004–2005 vs. 2005–2006	2005–2006 vs. 2006–2007
Elementary	High	5.08*	29.81**	55.95**	10.31**	27.38**	4.09*
	Low	22.40**	51.59**	107.41**	6.01*	31.78**	10.15**
Middle	High	0.03	0.27	2.05	0.12	1.59	0.84
	Low	0.11	0.96	0.27	1.73	0.74	0.21
High	High	0.60	7.71**	6.02*	4.01*	2.82	0.10
	Low	1.00	1.69	0.08	5.40*	1.67	1.07

* $p < .05$.
** $p < .01$.

Table 6
Mean number community members who actively participate in technology planning.

School level	SES level	2004–2005	2005–2006	2006–2007
All schools	All	0.92	1.40	1.46
Elementary	High	0.78	1.18	1.37
	Low	0.77	1.37	1.34
Middle	High	0.96	1.36	1.63
	Low	0.91	1.32	1.18
High	High	1.22	1.49	1.71
	Low	1.03	1.76	1.45

The changes in mean number of community stakeholders involved in the technology planning process by school level, SES level, and year are shown in Appendix B. In order of frequency, the three most involved stakeholders include parents, community members, and students. Business leaders were less frequently involved and less than 10% of the schools, irrespective of SES group or grade level, involve consortia in the technology planning process. Notably, high schools appear to involve more students and fewer parents than other school levels.

Table 6 describes the changes in mean community members that schools included in the technology planning process by school level, SES level, and year. The overall trend for all schools was an increase in the number community members who actively participate in the technology planning process from 0.92 in 2004–2005 to 1.46 in 2006–2007.

To determine if these differences were significant, multi-level models were estimated using the composite variable for the number of actively participating community members, while controlling for school level and SES level. The BIC indices decreased from 23814.9 for the unconditional model to 23357.3 for the final model, and the deviance statistic decreased from 23838.2 to 23528.1; both indicating better model fit. Differences were significant ($X^2 = 583.02$, $p < .0001$). In order to compare high SES schools with low SES schools, contrasts were run to find significant differences at each point of time. In order to have these models converge, Restricted Maximum Likelihood method was used to estimate the models. When the data are disaggregated by school level and SES level, differences are revealed (see Fig. 5).

Table 7 shows the contrasts between SES groups on the number of community stakeholders involved in the technology planning process. Two significant differences were detected based on the economic status of the students within the schools. In the most recent school year (2006–2007), high SES middle schools show significantly more community stakeholders involved in the technology planning process. During the 2005–2006, low SES elementary schools involved more community stakeholders, but this statistical difference faded in the subsequent school year.

To examine if the changes over time were significant for each SES level at each school level, contrasts between each point in time were analyzed for each SES level of each school level. Table 8 depicts significant trends by school level and SES level. As illustrated, from the 2004–2005 school year to the 2006–2007 school year, significant increases in stakeholder involvement were detected at all school level and SES groups, with the exception of high SES high schools (although it still increased). This finding provides further evidence of the increased involvement of diverse community members in the technology planning processes within schools.

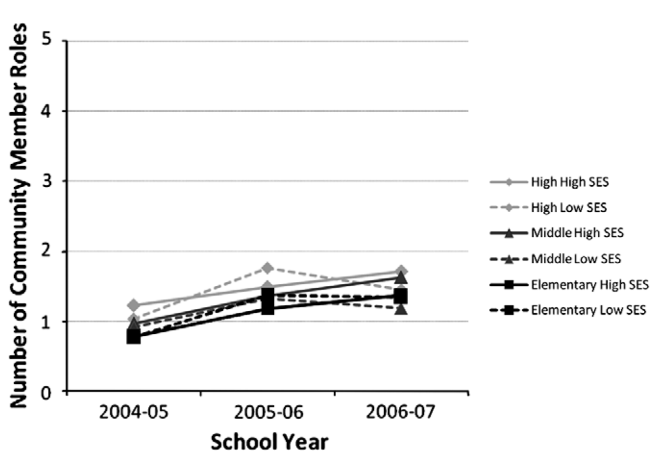

Fig. 5. Mean number of community members who actively participate in technology planning by school level, SES, and year.

Table 7
Significant differences between high and low SES schools in number of community members who actively participate in technology planning by school level and year.

Contributions/school level	Contrasts for high SES vs. low SES (*F*-value)		
	2004–2005	2005–2006	2006–2007
Elementary	0.03	4.89*	0.10
Middle	0.10	0.05	7.60**
High	1.18	2.26	2.10

* $p < .05$.
** $p < .01$.

Table 8
Significant trends in number of community members who actively participate in technology planning by school level, SES level, and year.

School level/and	SES level	Contrasts between years *F*-value		
		2004–2005 vs. 2006–2007	2004–2005 vs. 2005–2006	2005–2006 vs. 2006–2007
Elementary	High	21.12**	45.66**	4.67*
	Low	48.73**	43.67**	0.14
Middle	High	6.15*	17.09**	2.73
	Low	6.62*	2.89	0.76
High	High	2.1	7.25**	1.54
	Low	16.32**	5.43*	2.92

* $p < .05$.
** $p < .01$.

4.3. School commitment to sharing ICT resources

Research question 3: Are schools equally committed to sharing resources with the community at each school level and at high and low SES schools? The trends of three items were used to answer this research question.

(a) Four-year trends were used to answer: Are schools using digital devices to increase family access to ICT hardware and information?
(b) Three-year trends were examined to answer: Are schools using laptops to increase family access to ICT hardware and information?
(c) Two-year trends were examined to answer: Do schools have a policy for donations of computers either from the community or donations of computers to the community?

After the responses for the items related to these questions were dichotomized, the responses were compared using logistic regression for repeated measures. Table 9 presents the predicted percent of schools having each indicator for commitment for sharing resources with families and the community by school level and SES level. Generally at each level of school, high SES schools were predicted to have more commitment for sharing resources than their low SES counterpart, except for elementary schools in 2004–2005 which allowed some students to take digital devices and computers home. Between 2004–2005 and 2006–2007, the trends over time were up for all levels of school at all SES levels, except for low SES elementary and high schools. To see if these differences were significant, differences in the percent of schools that had the policy were tested using logistic regression for repeated measures. All schools at all levels and at all SES levels had significant changes for having some students being allowed to take computers home between 2004–2005 and 2006–2007. Results of this analysis of variance are delineated in Table 10.

Between 2005–2006 and 2006–2007 more elementary schools at high and low SES level had policies for accepting donated computers; however, fewer high schools and middles schools had these policies. There were significant differences in having policies for accepting donated computers by elementary schools for levels of SES and over time. Middle schools also demonstrated significant differences by SES level.

Table 9
Predicted percent of schools to have indicators for commitment for sharing resources with families and the community by school level, SES level, and year.

Indicator/school level	Percent yes							
	2003–2004		2004–2005		2005–2006		2006–2007	
	High SES	Low SES	High SES	Low SES	High SES	Low SES	High SES	Low SES
Some students may take digital devices home								
Elementary	8.0	5.8	4.1	4.3	16.4	12.7	23.1	17.5
Middle	19.9	14.8	19.1	14.8	37.5	37.0	39.0	35.6
High	45.8	29.1	42.1	25.2	77.6	54.4	74.8	45.6
Some students may take computers home								
Elementary	–	–	5.6	5.6	9.0	7.3	7.7	6.0
Middle	–	–	8.8	6.6	9.6	10.3	14.7	12.5
High	–	–	20.1	16.8	29.0	24.3	30.0	24.3
Policy for accepting donated computers								
Elementary	–	–	–	–	87.3	71.3	89.2	76.1
Middle	–	–	–	–	85.3	75.7	89.0	74.3
High	–	–	–	–	76.6	78.5	87.9	77.6

Table 10
Significant changes in percentages of schools with indicators of commitment to sharing resources with families and the community.

Indicator/school level	X^2		
	SES	Time	SES*time
Some students may take digital devices home (2003–2004 to 2006–2007)			
Elementary	44.1*	153.67**	5.32
Middle	0.8	62.43**	0.64
High	23.72**	83.2**	2.64
Some students may take computers home (2004–2005 to 2006–2007)			
Elementary	0.77	0.97**	1.52
Middle	0.02	6.63*	0.79
High	0.96	11.05**	0.09
Policy for accepting donated computers (2005–2006 to 2006–2007)			
Elementary	48.85**	5.41*	0.95
Middle	10.08**	0.16	0.89
High	0.91	2.65	3.7

* $p < .05$.
** $p < .01$.

4.4. Contributions to technology education of families and communities

Research question 4: Are schools equitably supporting the acquisition of technology skills of parents and community members by providing access to technology at school and home and by including parents and community members in training opportunities?

Table 11 depicts the mean number of contributions out of five possible supports for the technology education of parents or community members at a typical school in Florida. The overall trend from 2003–2004 to 2006–2007 has been for all schools at all levels to contribute more to the technology education of families and the community they serve.

The changes in mean number of contributions to the ICT education of families and the community by schools by school level, SES level, and year are depicted in Appendix C. The two most common strategies for using ICT to involve parents and community members are increasing technology awareness (e.g., providing technology updates in newsletter) and offering access to technology on campus (e.g., community member visits school to browse the Internet). Less than 30% of schools are providing hands-on technology training opportunities, and fewer than 10% of schools build partnerships with community partners to establish technology centers for community access.

When the trends are disaggregated by school level and SES level, differences are clear (see Fig. 6). High schools seem to offer the most contributions when compared to elementary and middle schools. When SES is examined, low SES elementary and middle schools are providing more contributions than their high SES counterparts. This means that those elementary and middle schools serving the most economically disadvantaged students are, on average, contributing more to the acquisition of ICT skills of their community and family members. At the high school level the trend is the opposite with high SES high schools providing more contributions to the families and community.

To determine if these differences were significant, multi-level models were estimated using the composite variable of number of contributions while controlling for school level and SES level. The BIC indices decreased from 26666.7 for the unconditional model to 26295.2 for the final model, and the deviance statistic decreased from 26643.5 to 26171.0; both indicating better model fit. Differences were significant ($X^2 = 1656.01$, $p < .0001$). In order to compare high SES schools with low SES schools, contrasts were run to find significant differences at each point of time (see Table 12). All of the contrasts were significant at $p < .01$ level, except there were no significant differences by SES level at the high school level in 2003–2004 (see Table 12). This finding suggests that schools at each level and each SES level provide different services that pertain to providing ICT access and training to communities and families.

To examine if the increases over time were significant, contrasts between each point in time were analyzed for each SES level of each school level. The overall trends between 2003–2004 and 2005–2007 were significant for every SES level at every school level (see Table 13). Changes for high schools at high SES were significant between 2003–2004 and 2004–2005. All school and SES levels were significant between 2003–2004 and 2005–2006, except for high SES elementary. Trends for low SES middle and high schools were significant between 2003–2004 and 2005–2006, 2004–2005 and 2006–2007, and 2004–2005 and 2005–2006. There were no significant trends between 2005–2006 and 2006–2007.

5. Discussion

The results of this study provide three major contributions to the literature: (a) the establishment of ICTs role in community and family involvement with the schools, (b) significant differences in how schools use ICT to interact with their *Spheres of Influence* based on the SES of schools (Epstein, 2001), and (c) trends toward bridging some aspects of the digital divide in Florida schools.

Table 11
Mean number of contributions by the schools to the technology education of parents or community by school level, SES level, and school year.

School level	SES level	2003–2004	2004–2005	2005–2006	2006–2007
All schools	All	1.69	1.73	1.93	1.91
Elementary	High	1.46	1.40	1.59	1.69
	Low	1.61	1.72	1.84	1.82
High	High	1.95	2.07	2.36	2.31
	Low	1.91	1.77	2.10	1.95
Middle	High	1.63	1.65	1.70	1.82
	Low	1.87	1.83	2.00	1.94

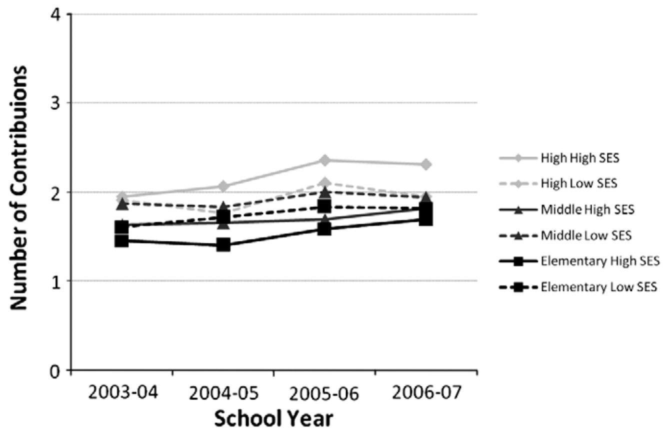

Fig. 6. Mean number of contributions by the schools to the technology education of parents or community by school level, SES level, and school year.

Table 12
Significant differences between high and low SES schools in number of contributions to the technology education of parents or community by school level and year.

Contributions/school level	Contrasts for high SES vs. low SES (*F*-value)			
	2003–2004	2004–2005	2005–2006	2006–2007
Elementary	167.58**	110.06**	126.54**	101.73**
Middle	20.61**	33.06**	16.16**	14.69**
High	3.62	23.51**	10.33**	11.37**

** $p < .01$.

Table 13
Significant trends in number of contributions to the technology education of parents or community for schools by school level, SES level, and year.

School level	SES level	Contrasts between years *F*-value					
		2003–2004 vs. 2004–2005	2003–2004 vs. 2005–2006	2003–2004 vs. 2006–2007	2004–2005 vs. 2006–2007	2004–2005 vs. 2005–2006	2005–2006 vs. 2006–2007
Elementary	High	0.55	3.57	11.81**	6.93**	17.48**	2.40
	Low	2.47	10.71**	8.96**	2.90	2.03	0.08
Middle	High	2.53	5.68*	7.61**	0.63	1.37	0.14
	Low	0.15	8.45**	12.02**	6.37*	9.52**	0.31
High	High	9.67**	12.10**	20.06**	0.14	1.88	1.00
	Low	0.03	4.68*	9.00**	4.01*	8.10**	0.71

* $p < .05$.
** $p < .01$.

It is important to highlight the large proportion of schools using technology-enhanced media to communicate with families and community members. In the 2006–2007 school year, more than 85% of Florida's schools, regardless of school level or SES status, used school websites to communicate with families and community members. Further, the results indicate an overall increase in the number of different ICT communication methods being employed by schools to reach diverse families and community members. Specifically, elementary schools significantly increased the number of methods used in each school year. In 2006–2007, the only significant difference identified based on SES was in high schools, in which those schools serving the most economically prosperous students were also using the most methods to communicate with community and family members.

It is important to know that schools are increasing the modes that they use to open communications with their families and communities; however, this research could not examine the content or the quality of these communications. Future research is needed to analyze the content of these communications and relate it to the ability of families and community members to access the information and use this information for their empowerment.

Another positive finding is the overall increase in the number of community members involved in the technology planning process within schools. There were significant increases in the number of community members involved in planning from the 2004–2005 school year in every category except high SES high schools. Parents, community members, and students were most often involved in the process. The only significant inequity identified in the most recent school year was in middle schools, in which high SES middle schools involved more community stakeholders. Involving community members in the ICT planning process can serve as a way to *mobilize* community and family members (Nettles, 1991). Future research needs to look at the relationship between the inclusion of diverse members in the planning process and the changes made in the technology plans. In addition, examination of how ICT is used to support the collaborative planning process would be beneficial to facilitating the mobilization of communities, families, and schools from diverse regions.

When investigating the contributions schools make to the development of family and community members in acquiring ICT skills and knowledge (or the *allocation* to and *instruction* of family and community members), some of the most interesting results are revealed (Nettles, 1991). An important consideration is that low SES high and middle schools are significantly less likely to have formal procedures for accepting donated computers from the community. This is an area that perhaps should be addressed by the FLDOE. Interestingly, over the four years both high and low SES schools, across school levels, have significantly increased their policies for allowing students to check-out digital resources. However, overall, schools are still fairly restrictive with their checkout policies. Coordination and organization of efforts by the community and schools is needed to efficiently utilize and share ICT resources that can empower students, families, and their communities. The FLDOE in collaboration with the Florida Department of Commerce might provide the leadership and develop the structures for a system for businesses, members of the community, families, and schools to use. Then community members at large would know where and how to share their expertise and resources, donate used and new resources, and acquire needed resources, supplies, and support.

The findings also show significant increases in the contributions schools make to family and community members from 2003–2004 to 2006–2007 in every school level and SES group. These findings provide strong evidence that schools are providing more ICT school-linked services to the communities in which they reside. Alternatively, this might be explained as schools using ICT to bring the *Spheres of Influence* closer together (Epstein, 2005) and increasing the social capital of families and communities (Coleman, 1987; Coleman et al., 1966; Lee & Bowen, 2006; Woolley et al., 2008). In particular, low SES elementary and middle schools are providing significantly more contributions than their high SES counterparts. However, the reverse case is true for high schools, in which the schools serving the most economically advantaged high school students are providing the most ICT contributions to their communities. Specifically, the findings also show that formal or informal programming for ICT awareness and ICT access on school campuses are the most frequent contributions.

All schools need to consider the dynamic relationship that they have with their families and neighborhoods. These important relationships can be used to increase the social capital and empowerment of citizens and families, which will improve the outcomes of the students in their schools. To facilitate this process, schools must provide the vision and take the lead by promoting open communications about the educational process, involving community members in the technology planning process, and sharing their resources and expertise with families and communities members in acquiring ICT skills.

This research aims at helping educators, researchers, parents, students, and legislators understand the role of ICT to foster community involvement as well as the differences between socio-economic groups that manifest as the digital divide. However, the findings presented here should not be interpreted as casual in nature. At minimum, they beckon the thoughtful attention of future research efforts to incorporate the important influence that schools have on their communities and role of ICT in this process.

Appendix A. Number and percent of schools that use ICT method for communication with families and communities by school level, by SES level, and school year

ICT method/school level	SES level	2003–2004		2004–2005		2005–2006		2006–2007	
		N	%	*N*	%	*N*	%	*N*	%
Classroom websites									
Elementary	High	267	57.7	309	66.5	346	74.4	370	79.6
	Low	85	18.4	121	26.0	151	32.5	167	35.9
Middle	High	88	64.7	106	77.9	103	75.7	112	82.4
	Low	53	39.3	59	43.4	67	49.3	70	51.5
High	High	57	53.3	74	69.2	85	79.4	91	85.1
	Low	38	36.9	48	44.9	66	61.7	65	60.8
e-Mail									
Elementary	High	347	75.0	380	81.7	395	85.0	406	87.3
	Low	189	40.8	276	59.4	292	62.8	311	66.9
Middle	High	114	83.8	127	93.4	125	91.9	127	93.4
	Low	93	68.9	100	73.5	107	78.7	109	80.2
High	High	93	86.9	96	89.7	99	92.5	102	95.3
	Low	75	72.8	82	76.6	93	86.9	91	85.1
Print media (newsletters, newspaper, flyers, brochures, etc.)									
Elementary	High	453	97.8	457	98.3	460	98.9	460	98.9
	Low	432	93.3	440	94.6	455	97.9	448	96.3
Middle	High	135	99.3	130	95.6	134	98.5	133	97.8
	Low	122	90.4	124	91.2	131	96.3	127	93.4
High	High	104	97.2	105	98.1	104	97.2	105	98.1
	Low	92	89.3	96	89.7	104	97.2	104	97.2
Radio broadcasting									
Elementary	High	24	5.2	32	6.9	42	9.0	42	9.0
	Low	15	3.2	35	7.5	41	8.8	42	9.0
Middle	High	9	6.6	8	5.9	9	6.6	12	8.8
	Low	11	8.2	9	6.6	19	14.0	11	8.1
High	High	4	3.7	16	15.0	15	14.0	16	15.0
	Low	15	14.6	22	20.6	17	15.9	21	19.6

Appendix A (*continued*)

ICT method/school level	SES level	2003–2004		2004–2005		2005–2006		2006–2007	
		N	%	*N*	%	*N*	%	*N*	%
School or website									
Elementary	High	424	91.6	437	94.0	446	95.9	445	95.7
	Low	357	77.1	383	82.4	385	82.8	410	88.2
Middle	High	130	95.6	132	97.1	132	97.1	136	100.0
	Low	113	83.7	120	88.2	127	93.4	129	94.9
High	High	106	99.1	105	98.1	105	98.1	107	100.0
	Low	95	92.2	101	94.4	106	99.1	102	95.3
Hotline									
Elementary	High	57	12.3	46	9.9	64	13.8	55	11.8
	Low	49	10.6	38	8.2	47	10.1	66	14.2
Middle	High	47	34.6	38	27.9	42	30.9	29	21.3
	Low	31	23.0	23	16.9	35	25.7	31	22.8
High	High	17	15.9	16	15.0	18	16.8	19	17.8
	Low	27	26.2	18	16.8	13	12.2	16	15.0
Television broadcasting									
Elementary	High	98	21.2	106	22.8	78	16.8	89	19.1
	Low	65	14.0	91	19.6	69	14.8	74	15.9
Middle	High	17	12.5	32	23.5	29	21.3	28	20.6
	Low	22	16.3	32	23.5	22	16.2	23	16.9
High	High	14	13.1	34	31.8	23	21.5	26	24.3
	Low	17	16.5	17	15.9	15	14.0	19	17.8
Mail									
Elementary	High	130	28.1	130	28.0	193	41.5	237	51.0
	Low	97	21.0	98	21.1	139	29.9	187	40.2
Middle	High	59	43.4	60	44.1	76	55.9	81	59.6
	Low	53	39.3	43	31.6	56	41.2	76	55.9
High	High	57	53.3	65	60.8	69	64.5	71	66.4
	Low	41	39.8	35	32.7	43	40.2	55	51.4

Appendix B. Number and percent of schools with active community member participation in technology planning by role, school level, SES, and year

School level	SES	2004–2005		2005–2006		2006–2007	
		Yes	%	Yes	%	Yes	%
Business leaders							
Elementary	Low	61	13.1	83	17.9	88	18.9
	High	57	12.3	102	21.9	98	21.1
Middle	Low	19	14.0	26	19.1	30	22.1
	High	16	11.8	21	15.4	20	14.7
High	Low	16	15.0	21	19.6	27	25.2
	High	20	18.7	28	26.2	23	21.5
Community members							
Elementary	Low	113	24.3	155	33.3	185	39.8
	High	106	22.8	180	38.7	164	35.3
Middle	Low	36	26.5	51	37.5	56	41.2
	High	29	21.3	43	31.6	38	27.9
High	Low	30	28.0	40	37.4	44	41.1
	High	27	25.2	41	38.3	38	35.5
Consortia							
Elementary	Low	1	0.2	2	0.4	3	0.7
	High	9	1.9	14	3.0	10	2.2
Middle	Low	3	2.2	4	2.9	5	3.7
	High	4	2.9	3	2.2	4	2.9
High	Low	1	0.9	4	3.7	7	6.5
	High	5	4.7	8	7.5	4	3.7

(*continued on next page*)

Appendix B (*continued*)

School level	SES	2004–2005		2005–2006		2006–2007	
		Yes	%	Yes	%	Yes	%
Parents							
Elementary	Low	164	35.3	263	56.6	293	63.0
	High	141	30.3	248	53.3	243	52.3
Middle	Low	51	37.5	70	51.5	90	66.2
	High	45	33.1	71	52.2	59	43.4
High	Low	45	42.1	53	49.5	59	55.1
	High	32	29.9	54	50.5	47	43.9
Students							
Elementary	Low	25	5.4	46	9.9	67	14.4
	High	44	9.5	94	20.2	108	23.2
Middle	Low	22	16.2	34	25.0	40	29.4
	High	30	22.1	42	30.9	40	29.4
High	Low	39	36.5	41	38.3	46	43.0
	High	26	24.3	57	53.3	43	40.2

Appendix C. Number and percent of schools making contributions to the ICT education of parents and community by method, school level, SES level, and year

School level	SES level	2003–2004		2004–2005		2005–2006		2006–2007	
		N	%	*N*	%	*N*	%	*N*	%
Schools are making an effort to increase technology awareness (e.g. PTA presentations, newsletters, websites, etc.)									
Elementary	High	380	82.1	402	86.5	400	86.0	397	85.4
	Low	340	73.4	383	82.4	379	81.5	368	79.1
Middle	High	112	82.4	114	83.8	111	81.6	111	81.6
	Low	107	79.3	117	86.0	108	79.4	110	80.9
High	High	86	80.4	89	83.2	84	78.5	83	77.6
	Low	80	77.7	85	79.4	88	82.2	79	73.8
We offer access to technology at our school									
Elementary	High	172	37.2	156	33.6	180	38.7	197	42.4
	Low	234	50.5	224	48.2	244	52.5	237	51.0
Middle	High	49	36.0	55	40.4	49	36.0	55	40.4
	Low	74	54.8	65	47.8	69	50.7	66	48.5
High	High	46	43.0	53	49.5	53	49.5	52	48.6
	Low	50	48.5	46	43.0	52	48.6	45	42.1
Schools have partnered with our community to establish technology access centers in locations other than the school									
Elementary	High	11	2.4	15	3.2	15	3.2	6	1.3
	Low	23	5.0	34	7.3	32	6.9	29	6.2
Middle	High	8	5.9	9	6.6	4	2.9	5	3.7
	Low	7	5.2	7	5.2	10	7.4	8	5.9
High	High	5	4.7	7	6.5	8	7.5	7	6.5
	Low	15	14.6	8	7.5	6	5.6	7	6.5
Schools offer hands-on technology training									
Elementary	High	74	16.0	65	14.0	71	15.3	85	18.3
	Low	121	26.1	138	29.7	139	29.9	128	27.5
Middle	High	26	19.1	24	17.7	18	13.2	20	14.7
	Low	45	33.3	38	27.9	39	28.7	35	25.7
High	High	23	21.5	29	27.1	25	23.4	23	21.5
	Low	22	21.4	24	22.4	22	20.6	28	26.2
Students are permitted to check out digital devices for home use									
Elementary	High	37	8.0	15	3.2	72	15.5	103	22.2
	Low	27	5.8	20	4.3	60	12.9	83	17.9
Middle	High	27	19.9	23	16.9	49	36.0	56	41.2
	Low	20	14.8	22	16.2	46	33.8	45	33.1
High	High	49	45.8	43	40.2	82	76.6	82	76.6
	Low	30	29.1	26	24.3	57	53.3	50	46.7

Appendix D. Supplementary material

Supplementary data associated with this article can be found, in the on-line version, at doi:10.1016/j.compedu.2010.02.004.

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