COMPUTERS FOR YOUTH

I. PROPOSAL SUMMARY

Computers for Youth (CFY) helps low-income students become engaged learners by using technology as a catalyst to improve their learning environment. We partner with public middle schools in poor neighborhoods and offer every family and teacher a home computer and our comprehensive services: training, initial Internet access, ongoing technical support, and tailored web content at our Community Corner website. We also have begun building an additional layer of programs to leverage the technology we have provided to the school community. This layer of programs supports teachers with additional training; creates student leaders through an after-school computer club and increases parental involvement by running technology events at the school after work. By ensuring that every family and teacher has a computer at home and providing innovative technology programming, CFY changes the learning environment of each school community. We help this change take root by providing the same technology and programs to the incoming class each fall. Our intervention purposefully catches students *before* they enter high school, when disengagement can result in their dropping out of school altogether. By using technology to engage middle-school students in their own learning, we enable them to succeed both in school and as life-long learners.

CFY is seeking a grant of $100,000 for general operating support. This funding will enable us to provide computers to 1,500 new families in FY04-05, and to provide technical support and services to 4,500 families in low-income neighborhoods who received CFY computers in prior years. The funding will also help us deepen our involvement with families and schools through a teacher training initiative, our student computer club and our parent tech events. Finally, this funding will help us further our research efforts.

II. NARRATIVE

A. Background

1. Mission and History

a. Mission

To help low-income students become engaged learners and thereby succeed in school, as life-long learners, and in the knowledge economy. To achieve this goal, Computers for Youth places computers in these students' homes and operates programs in their schools that increase parental involvement and improve teaching practices. CFY involves students in all aspects of what we do from teaching to tech support.

b. History

CFY began with the meeting of two New Yorkers who shared a similar vision – Dan Dolgin (a lawyer and private investor) and Elisabeth Stock (a former White House fellow and MIT graduate). In the mid-1990s, Mr. Dolgin became convinced that having a *home* computer was essential for developing the computers skills required to participate productively in the modern world. Ms. Stock reached the same conclusion while serving as a White House Fellow in 1997. During her fellowship she built a program that distributed surplus computers to schools, and observed firsthand that placing computers in schools was not enough. To develop technical fluency, children needed access to computers in their homes. The two joined forces and began CFY's operations in October of 1999, with Mr. Dolgin serving as its board chair and Ms. Stock as its Executive Director (CFY had already been established as a 501(c)3 nonprofit by Mr. Dolgin in 1998). In its first year, CFY provided home computers and its comprehensive services to all 230 families and teachers in a South Bronx middle school. CFY has now distributed over 3,500 computers and trained over 7,000 students, parents, and teachers from nine middle school. CFY has been featured in numerous news media including the *New York Times, Wall Street Journal*, *National Public Radio*, and *People*.

2. Need or Problem CFY Seeks to Address and Population Served

a. Need

Schools work best when students are motivated to learn. Yet this is not the case in most of our country's schools. A recent national study of 20,000 high-school students found that many are disengaged with learning: 50% say their classes are boring, 30-40% report that when they are in school, they are neither trying very hard nor paying attention, and most do not associate doing well in school with doing well in life.[1] The situation is particularly serious for low-income children, who are less than half as likely to graduate from high school as their middle-income peers.[2] In New York, graduation rates have reached crisis levels, especially among minorities: less than 30% of Latino students and only 35% of black students in New York graduated on time – the worst graduation rates in the nation.[3]

CFY helps low-income students stay motivated in school by addressing shortcomings in their learning environment both outside and inside the classroom. For example, low-income parents with low levels of educational attainment are less involved in their children's education than are higher-income parents.[4] In addition, teachers often have little understanding of how to assign homework in a way that encourages low-income parents to get involved and keeps students engaged. Finally, while a home computer can help low-income students become more engaged in their learning, most do not own one. A study by the

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[1] Steinberg, L.D. (1996). *Beyond the classroom: why school reform has failed and what parents need to do*. NY: Simon & Schuster.

[2] U.S. Department of Education, National Center for Education Statistics. *Dropout Rates in the United States: 2000*. NCES 2002-114. by Phillip Kaufman, Martha Naomi Alt, and Christopher D. Chapman. Washington DC: 2001.

[3] Greg Winter, "Worst Rates of Graduation Are In New York," New York Times (February 26, 2004).

[4] U.S. Department of Education, National Center for Education Statistics. *The Condition of Education 2001*. NCES 2001-072, Washington DC: U.S. Government Printing Office, 2001.

Corporation for Public Broadcasting found that only 35% of low-income children ages 9-12 have a home computer with Internet access, compared with 59% of middle-income and 80% of higher-income children.[5]

b. Our approach

CFY uses technology *as a catalyst for changing the way children learn*. A home computer (with comprehensive services and support) inspires students to learn on their own because they can conduct research at home, create their own "masterpieces," and explore their interests.

The computer can serve as a medium to strengthen relations with parents, teachers and peers. Students' relationships with parents become stronger as the CFY computer becomes the new *family hearth*. As described by one of our students "When somebody is on the computer, it is like a family thing, because everybody comes together." Children's relationships with teachers and peers improve through the use of electronic communication. Kids can get one-on-one attention from their teachers by emailing them after school and can connect with their peers and with pen pals in other countries. Especially for inner-city children who must stay home to stay safe, electronic communication can reduce social isolation and expand their worlds.

And by focusing on the community in which students live and learn, we improve their *learning environment.* Because we serve a critical number of families in each school community, we harness the network effect of technology – students can email their peers about homework, share websites they've found relating to school or their own interests, and help each other make the most of the software on their machines. This effect also extends to teachers, because they can expand their repertoire of homework assignments to incorporate technology. CFY's new training programs for teachers and parents leverage the technology to improve students' learning environment both in school and at home.

c. *Population Served*

CFY serves low-income children ages 11 to 13, their families and their teachers. We select our families and teachers by choosing public middle schools with a very high percentage of students (85% or more) eligible for free lunch.[6] Our families are predominantly Black and Hispanic and include immigrants, foster care families and those who live in homeless shelters. Our programs serve middle schools in some of New York City's poorest neighborhoods, including East Harlem, East New York, Washington Heights, East Flatbush/Brownsville and Canarsie.

3. Current Programs and Accomplishments

a. CFY's Core Program – Take IT Home NY

The Take IT Home NY program selects public middle schools that serve low-income students and then offers home computers and our comprehensive services to *all* the members of the school community. All students, parents and teachers participate in one CFY half-day training session where they learn basic computer skills on their *own* computer before taking it home. We insist that for each student, at least one parent or guardian attend the training session. This encourages intergenerational learning and motivates parents to become more involved in their children's education. Our training sessions are held on Saturdays in the students' school building. There, families have many "first experiences": the first time a child teaches his mother how to use a mouse; the first time a student sends and receives an email; the first time an immigrant father surfs the web and finds his local paper online. To encourage communication among community members, CFY provides all families with initial Internet access. CFY's bilingual Community Corner website (www.communitycorner.org), the default Internet home page on all our

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[5] Corporation for Public Broadcasting (2003). *Connected to the Future.* http://www.cpb.org/ed/resources/connected

[6] The percentage of children in a school receiving federally subsidized free lunches demonstrates the amount of poverty among the school's population. The more children receiving free lunches, the higher the incidence of poverty.

computers, helps families find relevant web content. Once families get their computers home, our ongoing tech support programs remove any obstacles to usage. Since 1999, CFY has distributed more than 4,500 computers and trained more than 8,900 students, parents, and teachers from ten schools.

b. New Layer of Programs

CFY has begun building an additional layer of programs to leverage the technology we have provided to the school community. This layer of programs supports teachers with additional training; increases parental involvement by running technology events at the school after work; and creates student leaders.

- **The Knowledge^{UP} Program.** Launched with a grant from the NYC Department of Education, CFY's Knowledge^{UP} program is designed to help teachers better incorporate technology into their practices. Participating teachers develop, test and refine technology "projects" that they assign to their students with the help of their CFY Tech Tutors – students who have received training from CFY in both software and tutoring methods. Participating teachers can receive graduate school credits through our partnership with Lehman College. CFY Tech Tutors will learn valuable leadership and critical thinking skills and enrich their own education through working directly with teachers.

- **"Tech Nights" Program.** The "Tech Nights" program is designed to increase parental involvement in education. These events bring parents, students, and teachers into the school on weekday evenings to learn more about computers. Our first Tech Night event, which was held in February 2004, was a great success: more than 60 students and parents attended. The Tech Nights are also an important extension of our tech support, as they give families an opportunity to get their PCs fixed by CFY staff. In support of the program, CFY has launched a student computer club that serves 8-12 students after school one day per week. The events are designed and staffed by students in the computer club and supervised by CFY staff.

c. Involving Youth in All Aspects of CFY's Work

CFY involves disadvantaged youth in running our help desk, providing technical support to families and building web content. By doing so, we help these youth build the job skills required for the technology sector.

- **"School to Work" Help Desk.** CFY operates a professional, bi-lingual help desk staffed by disadvantaged youth. These "help desk associates" develop marketable skills while providing technical assistance, via phone and email, to the families and teachers who have received CFY computers. The help desk operates 11 hours a day Monday through Thursday and for five hours on Friday. We currently have four help desk associates on staff, and have resolved more than 2,100 problems for the 4,500 families with CFY computers.

- **Internship Program.** This program trains youth interns **--** college and high school students whose backgrounds are similar to the communities we serve -- to support CFY's programs. Activities that interns participate in include contributing to the conceptual and technical design of our Community Corner website, working with CFY staff and students on the Tech Night and Knowledge^{UP} programs, and assisting with our research efforts.

d. Project Enhance: Improving Schools' Technology Infrastructure

Project Enhance distributes working computers to NYC public schools for use within the school building. Since September 1999, we have distributed more than 900 computers to 36 different public schools in five different boroughs. Placing computers in the schools enables teachers to better incorporate technology into their teaching. In FY04-05, we plan to distribute at least 100 additional computers to schools for use within schools, in both labs and classrooms.

e*. Program Outcomes*
Our research data shows that we continue to deliver significant impact on *relationships that reinforce learning* (such as with parents and teachers), improved *student engagement*, and better *academic performance*. The table below shows the percentage of CFY students who reported that their CFY computer impacted them positively. As you can see, the percentage of students who reported postivive impact from their CFY computer actually increased from FY01-02 to FY02-03.

Impact of having a CFY computer at home	**Acad Yr: 2001-02 (n~356)**	**Acad Yr: 2002-03 (n~280)**
Do better in school	73%	81%
Improve relationships w/ teachers	36%	47%
Make new friends	40%	47%
Like school more	45%	51%
Improve relationships w/ family	38%	48%
Make more curious	73%	76%
Make more confident	62%	71%

We are also currently conducting a controlled study, which will give us further data on the impact of our home computing program on student's academic abilities and engagement in learning. Our preliminary analysis, based on surveys, student journals, in-depth interviews, and teacher reports, is that low-income, ethnically-diverse middle-school students use and experience home computers in ways that are associated with greater academic engagement. Furthermore, we found that while greater home computer use corresponds with greater academic effort for all students, the relationship between home computing and academic engagement is much more nuanced and salient for low-performing students. Our research indicates the importance of reaching beyond typical descriptors of students' computing (such as time spent on computing) to include students' subjective experience and strategic use of these resources. It also suggests that the psycho-social benefits that children derive from home computer use may have widespread influence on how extensively they are able to realize the promises of computing for improving their lives.

4. Staff

CFY currently operates with 9 full-time paid staff, 8 part-time paid staff and over 65 volunteers. Key staff are full-time Executive Director (Elisabeth Stock), Managing Director (Susanne James), Senior Director of Technology (Louis Edwards), Director of Development and Planning (Mike Everett-Lane), Director of Research and Learning Services (Kallen Tsikalas) and Director of School Relations (Bill Rappel). All have core strengths in education and technology, and relevant track records of building and managing large projects (see the attached bios of our management team). Our part-time staff includes disadvantaged high-school students and graduates who help us refurbish computers, develop web content, provide technical support, and conduct research. Each year, we recruit approximately 80 professionals from the tri-state area as volunteers to help us train our families on Saturdays. Volunteers also help us with fund-raising, public relations and technical issues.

5. Relationships with Other Organizations; How CFY Differs from Other Organizations

- **Partners.** CFY's key partners are the schools through which we distribute our computers, Microsoft (software), companies such as Goldman Sachs and Time Warner (computer donations), the NYC Department of Education (warehouse space, logistics, professional development initiative), Regional Superintendents (per-session wages for teachers), Remedy (help desk software), and New York Cares (training volunteers). CFY maintains a continuous relationship with each school we work with, providing ongoing support and training to teachers.

- **The CFY Difference.** While there are many organizations that provide access to computers in schools, libraries and community centers, CFY provides access in the *home*, where students are able to learn independently, and where families can use the technology together. In the field of home computer access, we are a leader in providing the *training* and *support services* families need to make their home computers work, and the *educational programs* that change the school environment and turn computers into valuable educational tools. Finally, the CFY program has *proven results.* In addition to our *outputs* (numbers of computers distributed, numbers of individuals trained), CFY also has proven research-based *outcomes* in three areas: strengthened relationships among students, parents and teachers; increased student engagement with learning; and improved academic performance.

B. Funding Request

CFY is seeking a grant of $100,000 for general operating support. This funding will enable us to reach our goal of providing computers to 1,500 new families in FY04-05. CFY will provide home computers to all the incoming students in six school communities we worked with in FY03-04, plus students in at least one new school, to be determined:

- <u>IS 409</u> in East New York (~50 incoming families and teachers)
- <u>MIAVA</u> in East Harlem (~40 incoming families teachers)
- <u>TIME</u> in East Harlem (~155 incoming families and teachers)
- <u>Talented and Gifted</u> in East Harlem (~60 incoming families and teachers)
- <u>Arthur Somers</u> in East Flatbush/Brownsville (~175 incoming families and teachers)
- <u>Mirabal Sisters</u> in Washington Heights (~350 incoming families and teachers)
- <u>New middle school</u> (~670 incoming families and teachers)

In addition to the 1,500 new families, we will continue to provide support services to 4,000 middle school students who received CFY computers in prior years. The funding will also help us expand our new programs -- the teacher training initiative and our parent tech events.

C. Evaluation

As a performance-based organization, CFY has built an in-house research department to help us better understand the benefits low-income families derive from our programs. We use our research to demonstrate our programs impact for funders and stakeholders, to help us improve our programs and allocate our resources, and to help shape local and national policy on education and technology. Kallen Tsikalas, our Director of Research and Learning Services, runs CFY's research department; she comes to CFY with seven years of research experience at the Center for Children and Technology EDC. CFY's research department uses a variety of instruments for research/evaluation, such as intake surveys, follow-up surveys, focus groups, interviews and an interval-contingent recording (ICR) technique or "nightly log." Our research analysis includes statistical analysis of quantitative data and thematic coding of qualitative data. This spring semester, our research department is conducting our first controlled study in two East Harlem schools. To date, we have published our research findings in three papers and have presented them at the AERA (American Educational Research Association) conferences in 2002 and in 2004. To ensure the highest quality research, our research department works with consultants from the UCLA Psychology Department and Teachers College at Columbia University.

COMPUTERS FOR YOUTH
OPERATING EXPENSE BUDGET
FY 2004-2005

Expenses		
Distributing Computers		
Computers & computer equipment donated	$136,000	
Computer components purchased*	$56,000	
Software donated	$75,000	
Software purchased	$18,000	
Inventory scrap expense	$47,000	
Shipping Expense	$30,000	
Total Distributing Computers		$362,000
Personnel Expenses		
Salaries & wages	$639,000	
Employee Benefits and Payroll taxes/fees	$93,000	
Total Personnel Expenses		$732,000
Rent & utilities		
Offices	$48,000	
Warehouse (donated)	$78,000	
Total Rent & utilities - office		$126,000
Office/Warehouse Expenses***		$20,000
Telecommunications expense		$18,000
Depreciation & Amortization		$9,000
Insurance - Commercial/Liability		$4,000
Professional fees		
Legal, audit, accounting	$22,000	
Website, IT, other	$20,000	
Research	$12,000	
Other (fundraising, public relations, etc.)	$50,000	
Total Professional fees		$104,000
Other expenses****		$11,000
Total Expenses		**$1,386,000**
Increase in Operating Reserve		**$150,000**

* Computers components purchased include hard drives, modems, CD-rom drives, sound cards, keyboards, mice and powercords.

** Software provided to families includes Windows 2000, Sun's Star Office, Cybersitter 2000, and initial Internet service.

*** Office/warehouse expenses include conference & meeting fees; dues, publications & subscriptions; staff recruitment; postage & delivery; printing & reproduction; supplies; and office software.

**** Other expenses include student incentives, research incentives and uniforms for trainers.

Differential Effects of Home Computing on the Academic Engagement of Low- and High-Performing Middle-School Students in Low-Income Communities

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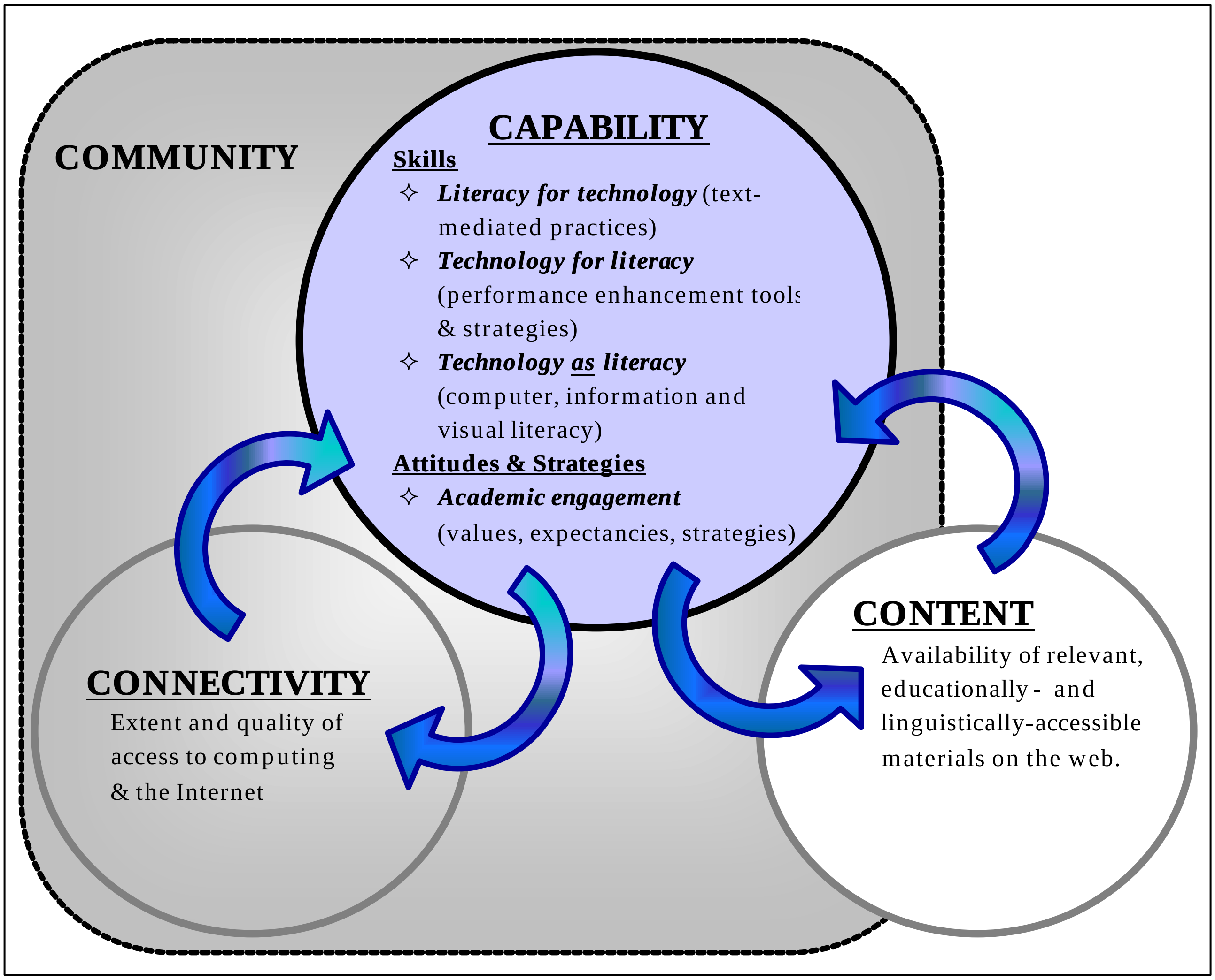
Differential Effects of Home Computing on the Academic Engagement of Low- and High-Performing Middle-School Students in Low-Income Communities

Purpose of the Research

Traditionally, the Digital Divide has been conceptualized as a matter of *access* (or lack thereof) to technology and information. We now understand, however, that the rift between those who are digitally empowered and those who are not is the product of at least three interacting factors: 1) connectivity; 2) capability; and 3) content (Dorr and Besser, 2003; Lankshear, 1997). *Connectivity* signifies the degree and quality of access to computers and the Internet. *Capability* represents personal factors—literacy skills, attitudes and strategies—that influence one's ability to use these technologies effectively and extract meaning from the medium. *Content* generally refers to accessible web-based materials, those available at various reading levels, in various languages that are relevant to underserved communities. See Figure 1.

Figure 1: Model of the Digital Empowerment: A Multi-Factor Solution to the Digital Divide



The factors of connectivity, capability and content interact. For example, greater capability allows for more efficient retrieval of information and more effective interpretation and use of digital content and tools. Similarly, higher literacy corresponds with greater connectivity regardless of income (Robinson, DiMaggio, & Hargittai, 2003). More importantly, however, connectivity can enhance individual capabilities: Individuals can practice skills, review and remediate, find and organize information, seek help, connect with others.

This paper focuses on the relation between connectivity and capability. We examine the impact that connectivity has on students' capabilities—their skills, attitudes and strategies. We focus especially on how adolescents' home computing relates to their academic engagement.

Academic engagement is critically important during adolescence. The decline in middle school students' engagement with school is well documented and corresponds with declines in academic achievement. However, despite extensive teacher testimony that computing can enhance adolescents' engagement with school, little research has systematically and quantitatively examined whether middle-school students' home computer use might help keep them engaged in school.

This study fills an important gap in the literature. It uses quantitative methods to assess the relationship between home computer use and academic engagement among low-income, ethnically diverse students. Furthermore, it evaluates whether there is a difference in the patterns of computing and academic engagement for low- versus high-performing adolescents.

Theoretical Framework

Academic engagement is believed to be an important predictor of children's success in school. Engaged students put more effort into their school work, employ and adapt strategies to regulate their own learning, cultivate relationships that support learning, practice certain positive academic behaviors such as asking questions in class, and feel a sense of academic self-efficacy (Bangert-Downs and Pyke, 2002; Kuh, 2001; Miller, 2003; Newmann et. al., 1992; Zimmerman, 2001).

Research has found that students often become *less* engaged with school during the critical adolescent years (Miller, 2003; Steinberg, Brown and Dornbusch, 1996). For example, Steinberg et. al. (1996) found that 30-40% of 20,000 teens surveyed were neither trying very hard nor paying attention when they were in school, and that 30% said they had lost interest in school and were not learning much. Not surprisingly, the most vulnerable students are low-income, low-performing students for whom disengagement can have disastrous consequences (Gutman and Midgley, 2000; Scales and Leffert, 1999).

Over the last two decades, there has been a growing body of *qualitative* evidence suggesting that computer use may mitigate adolescent disengagement. For example, a number of studies have shown that middle-school students who use computers at home become more academically engaged (Becker, 2000; Marshall, 2002; Hill, 1996; Reaux et al., 1998; Sandholtz et. al., 1994) and, in some cases, perform better in school (BECTA, 2002; Michigan State University, 2003; Honey and Henriquez, 1997).

This paper attempts to take the prior research to a new level by answering the question: *Under what circumstances or conditions* does home computer use increase middle school students' engagement with school?

To answer the question, we borrow from existing research about self-regulated learning, academic engagement, and adolescent computing. We examine patterns of home computer use and academic engagement for low- and high-performing adolescents from low-income communities. We use a correlational research design to associate measures of home computer use and academic engagement for these middle-school students.

Methods

Participants

89 students and seven teachers participated in the entire study.[1] The student sample consisted of 54 females and 33 males, ranging in age from 11 to 14 years, with the greatest number aged 13 (M=12.7, SD=0.98). Forty-five percent of students were in eighth grade, 27% were seventh graders, and 27% were sixth graders. Of the 52 participants who reported ethnicity, 34.6% identified themselves as African-American, 32.7% as Caribbean-American, 25.0% as Latino, and 7.7% as multi-ethnic. Forty-seven students were grouped as high-performing, and 39 as low-performing according to criteria described in the following section. There were no significant demographic differences between these two groups.

Participants in the study attended one of three urban middle schools. These schools, with over 85% of enrolled students eligible for the Federal free lunch program, took part in the *Take I.T. Home NY* program operated by Computers for Youth (CFY)—a NYC-based non-profit organization. In this program, all students and teachers were offered free home computers, initial Internet access, basic computer training, technical support, and tailored Web content.

Data Sources

Data for this study were collected using three different instruments: 1) daily “journals” submitted by students on three consecutive days 3-6 months after they received their CFY home computers; 2) written surveys completed by students 5-8 months after they received CFY computers; and 3) ratings forms completed by one teacher for each student.

Home computer use was assessed in the following ways:

- *Average daily computing-overall use*. Participants’ daily computing was assessed using items adapted from Gross et al. (2002). In their daily journals, students indicated how much time they spent on their home computers by marking one of five alternatives (none, 30 minutes or less, 1 hour, 2-3 hours, 4 hours or more). These values were converted to absolute time values and averaged over the number of journals completed.
- *Frequency of home computer use*. Participants were asked how many days in the last two weeks they had used their computers. On the survey, they marked one of five responses (not at all, 1-2 times total, 3-5 times total, at least twice a week, every day).
- *Self-regulated learning (SRL) through computing*. We assessed participants’ strategic use of computing with items adapted from Zimmerman and Martinez-Pons (1988). In their daily journals, students indicated whether they had used their computers for SRL strategies such as finding information for school, seeking help from others, organizing information, etc. An index of the total number of computer-based SRL used was created. The reliability alpha was .8304 for this six-item index.

[1] 130 students participated in the daily journal and teacher assessment components of the study.

- *Subjective experience of computing*. Students evaluated how they experienced their home computers as contributing to their quality of life. On the survey, they rated to what extent they believed each of seven statements was true for them. Statements were derived from our previous qualitative research and included items like: "Having a home computer has… helped me do better in school, make new friends, improved my relationships with my family," etc. Students marked one of four responses (not at all, a little, some, a lot). An index was created to represent the richness of computing experience. The reliability alpha was .8570 for this seven-item index.

Academic engagement was evaluated in the following ways:

- *Student effort in class (teacher-rating).* With a measure adapted from the teacher version of the Child Behavior Checklist (Edelbroch and Achenbach, 1984), teachers rated how hard students had worked in their class during the year. Scores ranged from 1 to 7, with higher scores indicating greater effort.
- *Student effort in school (self-report)*. Using the same scale, students rated how hard they worked in school during the year on the survey
- *Engaged Learning Activity Index*. The degree to which students participated in certain engaged learning activities was measured using items adapted from the National Survey of Student Engagement (NSSE, 2002; Kuh, 2001). On surveys, students were asked how often during the school year they participated in five specific activities such as "asking questions in class or participating in class discussions" and "worked on a paper or project using information from many sources." They marked one of four response options—never, sometimes, often, and very often. Their responses were combined into a single engagement index. The reliability alpha was .6796 for this five-item index. We also considered items individually for some analyses.

  We used response process and convergent/discriminant evidence to ensure validity of the *Engaged Learning Activity Index* for middle school students. We pilot tested items from this index with two small groups of middle school students identical to our target population. In the pilot test, sixth graders were asked to describe in their own words what each of the items meant. Additionally, we correlated scores on the engaged learning activity index with teachers' ratings of students' effort. As expected, we found the two to be positively and significantly associated especially for low-performing students, $\underline{r}$ (39) = .370, $p<.05$. Finally, we correlated engaged learning scores with students' ratings of how often they got in trouble at school. Again, as expected, we found the two to be negatively and significantly associated especially for low-performing students, $\underline{r}$ (36) = -.391, $p<.05$.

School performance included measures of:

- *Student performance in class (teacher-rating).* With a measure adapted from the teacher version of the Child Behavior Checklist (Edelbroch and Achenbach, 1984), teachers rated how well students performed in their class during the year. Scores ranged from 1 to 7, with higher scores indicating higher performance.
- *Split of low- and high-performing students*. Students who received teacher performance ratings of 1-4 were placed in the low-performing group. Those who received ratings of 5-7 were identified as high-performing.

Results

Descriptive data on home computer use

Low- and high-performing students used their home computers for roughly the same amount of time and in similar ways. For example, they engaged in computer-based learning activities for equivalent amounts of time and made use of approximately the same number of computer-based SRL strategies. Their subjective experiences of home computing, however, differed. Namely, low-performing students were significantly more likely to report that having a home computer *helped me feel more confident in what I can do*, $t(77)=2.63$, $p<.05$), and *improved my relationships with my family*, $t(79)=2.07$, $p<.05$.

Descriptive data on academic engagement

Low- and high-performing students did *not* differ significantly in their overall self-reports of engaged learning behaviors. However, they did differ in the amount of effort they invest in school as indicated by their own assessments. Higher-performing students put more effort into school than lower-performing students, $t(70)=1.965$, $p=.054$.

Students' engaged learning behaviors and effort are related but distinct. Perhaps due to the format of the items, students' ratings of effort in school were somewhat negatively skewed: Regardless of performance level, students' relative effort assessments tended to be much higher than their relative engaged learning activity scores. We suspected that effort scores were inflated.

Comparative data on the relationship between home computer use and academic engagement

Regardless of performance level, students who spent more time on their home computers also worked harder in class: The students w ho teachers rated as having invested more effort in class were low-performing students who used their home computers more frequently, $r\ (37)=.396$, $p<.05$, and high-performing students who used their home computers for more time each session, $r\ (46)=.410$, $p<.005$.

It is here that the similarities between high- and low-performing students end. Whereas for high-performing students there were few other associations between home computer use and academic engagement, for low-performing students, there were many.

Low-performing students' subjective experiences of home computing were highly related to their engaged learning behaviors. For example, those students who *experienced home computing* as *increasing their confidence* also asked questions and participated in class discussions more often, $r\ (36)=.529$, $p<.01$. Similarly, those who *experienced home computing* as *improving family relationships* asked questions and participated in class discussions more often and more frequently used information from many sources for school papers or projects; $r\ (37)=.401$, $p<.05$ and $r\ (36)=.473$, $p<.01$ respectively. These findings have added weight given the strong relationship between students' class participation and teachers' ratings of performance for both groups.

Additionally, low-performing students who *used more computer-based SRL strategies* also participated in more engaged learning activities, $r\ (39)=.417$, $p<.01$. In particular, those students who used their computers to *organize information* and to *keep records* were more actively engaged in their learning. Surprisingly, *use of home computers to seek information* was <u>not</u> strongly associated with engagement or performance in school for either group of students.

Using the model to predict academic engagement

Stepwise multiple regression analyses were performed to determine the amount of variance in academic engagement accounted for by various individual factors including students' sex, age, performance rating (by teacher), time on computer, SRL strategy use, and subjective experiences of computing. For these analyses, we again explored differences in the total sample versus low-performing students. And again, we observed differences. Table 1 indicates the results of these analyses.

Table 1: Stepwise Multiple Regression of Influence Variables on Academic Engagement

Influence Variable	Standardized Beta	R	Adjusted R^2	R^2 Change
All students in sample				
1. *Having a home PC helped me feel more confident in what I can do*	.328	.274	.063	
2. *Performance in Class – Teacher Rating (raw score)*	.304	.406	.143	.080
Low-performing students in sample				
1. *Having a home PC helped me feel more confident in what I can do*	.494	.505	.233	
2. *Mean daily time on home computer*	.404	.646	.382	.149

These data demonstrate that, at least for low-performing students, patterns of home computing accounted for a moderate amount of the variance in academic engagement. While other variables were significant in the regression analyses, collinearity was sizeable enough to prevent them from being included in the final regression models.

Discussion

Participants in this study were all adolescents from low-income communities—the communities likely to fall on the less connected side of the Digital Divide. For all these young people, greater home computer use corresponded with greater academic effort and engagement. Furthermore, more frequent use of computers at home was associated with greater class participation, which in turn, was related to higher levels of academic performance as rated by teachers.

Yet, the students in this sample were not homogenous in their use or experience of home computers. Surprisingly, lower-performing students reported more positive subjective experiences of home computing. Home computing helped them feel more confident about other things in their lives (not just computing) and it improved relationships with their families. For all students, but most powerfully for these lower-performers, feeling that having a home computer helped improve one's confidence was the factor in the model most strongly predictive of academic engagement.

Concerns may be raised about the use of *improved self confidence* as a variable that influences academic engagement. Global self-confidence, in contrast to task-specific self-efficacy, is not highly predictive of academic achievement in children. American students, in particular, are likely to report having much greater confidence in their skills and ability than is evidenced by objective of these characteristics.

Despite such reservations, however, it appears that improved confidence as a result of home computing is a real phenomenon. It differentiates itself from other experiences of home computing and predicts academic engagement, especially in lower-performing students. In such, it deserves more focused study:

What types of home computing are associated with enhanced self-confidence? How does home computer use improve self-confidence? Does it increase self-efficacy for academic tasks? Does it provide additional channels for remediation, allowing students to seek and get the help they need to feel more confident? Does it connect them with peers and change negative self-judgments of ability or belonging?

It is also notable that for higher-performing students, computer activities and experiences are much less predictive of academic engagement. These students may already be more engaged in school. Alternately, they may have had more exposure to and experience using computers. Being more accustomed to incorporating computing into their lives, they may be less likely to experience it as having a unique impact on their lives or families.

Limitations

Four major limitations are apparent in this study. First, because this research design is correlational, no causal inferences may be drawn. We believe the results here are provocative enough, however, to warrant further, experimental research. Second, the performance indicator on which we based most of the analyses of this study was one teacher's norm-referenced rating of each student. Students are not equally engaged in all classes, nor do they perform the same in all classes. Hence, in the future, we must include multiple indicators of academic performance: ratings by more than one teacher, test-scores, objective assessments of writing, etc. Third, the *Engaged Learning Activity Index* as currently constructed, is based on measures for high school and college students and may not be sensitive enough to capture *younger adolescents'* relationships with school or academic content. We plan to refine this index, adapting and adding items from the *Student Participation Questionnaire* (Finn, Pannozzo, & Voelkl, 1995). The SPQ measures discrete, positive learning behaviors with subscales for initiative and effort; it was designed for use with fourth grade students.

Finally, academic engagement was measured at a single time point. Given that engagement is like to be a quality that fluctuates situationally, especially for low-performing students, data obtained at a multiple time points might more validly reflect the associations between home computing activities and academic engagement. Additionally, instructional context and climate may greatly influence academic engagement, and this is not presently indicated in the data.

Implications

Implications for Policy. This study shows that at a time when many of their peers may be disengaging with school, low-income, low-performing middle school students who use and experience home computers in certain ways report greater academic engagement. Consequently, providing such students with home computers and support may be an effective method to keep them interested and engaged with school. Furthermore, providing low-performing adolescents with specific computer-based content (e.g., reading remediation software, educational games, or on-line tutoring) that they can use at home on their own time at their own pace may substantially enhance their capabilities—not just with technology but also with academics and life skills.

Implications for Research. This research demonstrates the importance of reaching beyond typical descriptors of students' computing (such as time spent on computing) to include students' subjective experience and strategic use of technology. The psycho-social benefits that children derive from computing may have widespread influence on how they use these technologies and how extensively they are able to realize the promises of computing for improving their lives. Similarly, the study broadens the concept of capability that is used in digital empowerment models. Our concept of capability includes not just cognitive skills such as print or information literacy, but also motivational components. Students must have the motivation to initiate and persist at deeper uses of computing as well as the skills to do so.

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