Brightening horizons:
The impact of after school programs on children's computer skills

A report of the 2003-04 Missouri 4-H After School Computer Labs Project

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DESE/4-H After School Computer Labs Project

The DESE/4-H After School Computer Labs Project is a partnership between the Missouri Department of Elementary and Secondary Education (DESE) and Missouri 4-H Youth Development Programs of the University of Missouri Extension. The project originated with the goal of "brightening horizons" by creating opportunities for young people to develop mastery, self-confidence, and social interaction through access to computers and educational software. Specifically, the project involved the startup and expansion of technology-based after school programs for upper elementary and middle school age children. State and regional extension staff provided training, technical assistance, and resources to local communities starting or expanding lab programs. A resource manual was distributed to partners with information on after-school program research; youth development theory and practice; selecting software for youth; adding educational value to computer games; program planning and lab management; and resource development. Lab programs were also provided with access to a statewide software lending library; lab-based trainings and consultations; 4-H club development materials; and grant writing assistance.

In 2002, Missouri 4-H and the Community Development Program of the University of Missouri Extension collaborated with the Corporation for National and Community Service to bring AmeriCorps*VISTA (Volunteers in Service to America) workers as resources to support local computer labs and expand the project statewide. Ten VISTA volunteers, along with regional extension faculty, reached 1,025 youth in 45 after-school computer lab sites in 2003. State and regional faculty, and VISTA members collaborated with local agencies and groups to offer non-credit training to 2,092 after school program staff and volunteers. Trainings focused on introducing computers and educational software to after school programs, increasing lab program quality, and measuring effects of lab programs on children. With funding from DESE, Missouri 4-H also provided grants to local projects to support volunteer and staff development, and project evaluation.

The DESE/4-H After School Computer Lab Model was designed to engage young people in discovery and exploration through educational software. Students learn computer skills, develop learning strategies, and learn the content present in educational software. Computer labs also offer a supportive environment in which children can learn at their own discretion and pace, under the supervision of a caring adult. In 2001, the Missouri New Communities Project (NCP) developed a set of evaluation tools to assess how well participants were gaining computer skills in lab programs (Dunn and Arbuckle, 2002). The NCP project was sponsored by the national Children, Youth, and Families At-Risk (CYFAR) Program, and administered by Missouri 4-H. The computer lab evaluation tools were nationally recognized by the CYFAR 2004 Exemplary Evaluation Award.

Prior research

This study adds empirical evidence to prior research on the impacts of youth participation in technology-based after school programs. One qualitative study conducted with 87 after school computer labs located in 51 school districts and 22 community-based locations yielded results that help frame this study (Benesh and Pabst, 2002). The research question asked: "From the adult perspective, what happens when upper elementary and middle school students participate in after-school computer lab programs?" Data were collected from 25 of the 87 computer labs via surveys, in-depth interviews, observations, and examination of resource documents. Major findings included:

- Many of the students who participate in lab programs do not have other access to technology.
- Play-based computer activities offer students opportunities to learn academic and social skills.
- Lab personnel and visiting teachers report that academic and social skills transfer to outside interactions and classroom learning.
- Students are exposed to a range of educational subjects that moved beyond those they were exposed to in the classroom.
- Students demonstrate increasing fluency with computer skills and willingly share their expertise with other students and adults.
- Students demonstrate willingness to share, take turns, and collaborate with other students.
- Students and teachers reverse traditional teaching and learning roles in labs.

Report summary

This study attempts to provide corroborating evidence for at least two prior findings: 1) computer skill development in youth lab participants, and 2) computer skill application transferable to student academic performance. It offers quantitative evidence in support of computer skill development in youth lab participants, and qualitative evidence of computer skill application that will likely result in improved performance in school. Finally, the report addresses the implications of these findings and offers recommendations for future research on measuring the impact of technology-based after school programs on school performance and preparation for the workplace.

Part I—Measuring Computer Skill Development

The instrument. The instrument used for this study was the award-winning computer skills assessment developed by the Missouri New Communities Project in 2001 (Dunn and Arbuckle, 2002). The instrument is a task-based assessment, which asks young lab participants to complete a series of multi-step tasks to demonstrate competence in six common computer skill areas: 1) basic operation; 2) worldwide web; 3) email; 4) word processing; 5) advanced word processing; and 6) advanced operation. A trained evaluation team conducted the assessment at each site by asking respondents to complete tasks, and recording whether respondents were able to complete up to 96 distinct tasks.

The sample. Data were collected from children participating in four programs in Callaway County, Madison County, Pettis County, and Polk County, Missouri. Sample counties were selected to represent a variety of population sizes, geographical regions, participant age/grade levels, and lab locations. The population size of sample counties ranged from very rural (11,800) to regional centers (40,766) (Missouri Census Data Center, 2004). Geographical regions included central, southeast, west central, and southwest regions of Missouri. Participant age/grade levels ranged from first to eighth grade. Sample sites included school-based labs (Madison and Polk) and community-based labs, or labs located in non-school settings (Callaway and Pettis).

The methods. Skill assessments were conducted by 4-H staff and AmeriCorps*VISTA members on all youth lab participants at the four sample sites between 2002-03. The skill assessment was administered to seventy-five respondents. Some sections of the skill assessment could not be completed due to a lack of access to email and/or the worldwide web at some lab sites. Scores from each assessment were manually entered into a spreadsheet. After the initial data entry, each survey was checked again to ensure accuracy. Data for each respondent were recorded for up to six skill areas. The number of questions attempted for each skill area was summed, as was the total number of questions completed successfully. A percentage score (or completion rate) was computed for each section by dividing the total number of skills attempted by the total number of skills completed. Sums of the items attempted and completed were then used to create an overall task completion score for each student. Another round of checks was completed to ensure that all formulas were correct and computations matched with the responses of each survey.

Computer Skill Assessment Results

Anticipated findings. It was anticipated that children participating in after-school computer labs would demonstrate basic computer skills, as measured by the computer skill assessment. It was also expected that anecdotes on the application of computer skills in lab-based projects and activities would demonstrate skills are transferable to school and workplace. Finally, overall task completion rates, it was anticipated, would be comparable to results from other lab programs using the computer skill assessment.

Attempt rates. Attempt rates are an initial indicator of children's computer skill development. A child who attempts a computer task during testing has likely attempted the same or a similar task before, whereas a child who has never attempted the task is less likely to attempt it. Attempt rates are also the base from which task completion rates are derived. For the entire sample (n=75), 100% of respondents attempted to complete basic operating tasks. Worldwide web tasks yielded a 69% attempt rate and word processing tasks a 68% attempt rate, respectively. Due to a lack of access to the worldwide web at some lab sites, not all respondents had the opportunity to attempt those tasks during testing (N=52).

Task completion scores	Grade group			
Skill area	K-6		7-12	
	N	Mean	N	Mean
1: Basic operating	53	.80	7	.94
2: Worldwide web	37	.59	1	1.00
3: E-mail	0	0	1	.69
4: Word processing	31	.66	7	.94
5: Advanced word processing	6	.60	7	.78
6: Advanced operating	5	.35	6	.70
7: Overall	53	.70	7	.86

Table 1. Basic skill development

Task completion. Task completion rates are an indicator of successful skill development in a given task area (see Table 1). Respondents in grades K-6 completed 70% of all tasks attempted, and respondents in grades 7-12 completed 86% of all tasks attempted. Among K-6 students, basic operating skills (such as identifying parts of a computer, turning a computer on, opening programs, inserting media disks, and accessing files), had the highest task completion rate (80%). Word processing skills had the next highest level of task completion (66%), followed by advanced word processing skills (60%) and tasks involving the worldwide web (59%). For grades 7-12, basic operating and word processing skills had equal completion rates (94%). Advanced word processing skills had the next highest level of task completion (78%).

County results. Task completion rates by county offer a look at more local results, and an angle from which to consider the influence of various factors on computer skill development (see Table 2). Task completion rates were most consistent between all counties on basic operating skills (12 percentage points). Rates varied the most between counties on word processing skills (32 percentage points). Overall completion rates by county differed by 18 percentage points, with community-based lab sites (Callaway and Pettis counties) and school-based lab sites (Madison and Polk counties) faring about the same. Variation in completion rates between counties may illustrate that differences in lab projects and activities between sites have differing skill development potential. For example, Polk and Madison counties scored highest on worldwide web task completion. By comparison, Pettis and Polk Counties scored almost equally on basic operating and word processing skills. Whether playing a typing game to learn keyboarding skills, or writing a letter to a senator to learn word processing skills, software selection and lab activities may be altered to afford youth more opportunities to become proficient at certain skills.

Table 2. Task completion by county

Task completion scores	County									
Skill area	Callaway		Madison		Pettis		Polk		Total	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
1: Basic operating	41	.77	15	.86	16	.88	3	.89	75	.82
2: Worldwide web	35	.57	14	.70	0	0	3	.83	52	.62
3: E-mail	0	0	0	0	0	0	1	.69	1	.69
4: Word processing	23	.62	15	.76	11	.86	2	.94	51	.72
5: Advanced word processing	0	0	5	.48	11	.69	2	.74	18	.63
6: Advanced operating	0	0	4	.41	11	.54	0	0	15	.51
7: Overall	41	.66	15	.72	16	.76	3	.84	75	.71

Comparison to other results. Computer task completion rates for youth in this sample are comparable to task completion rates for other lab sites (Dunn and Arbuckle, 2002). Results from two lab programs supported by the Missouri New Communities Project (NCP), the West End Community Center Lab in St. Louis and the Irondale Community Lab, are similar to those from the four VISTA lab sites in this study (see Table 3). On basic operating and worldwide web task completion, results from the two study groups are virtually the same. VISTA project sites yielded slightly higher rates of task completion on word processing (72%), advanced word processing (63%), advanced operating (51%), and overall (71%). Overall skill development for both study groups is evident in task completion rates of nearly 50% or more.

Table 3. Comparison to other skill assessment results

Task completion scores	Study groups			
Skill area	VISTA sites		NCP sites	
	N	Mean	N	Mean
1: Basic operating	75	.82	52	.84
2: Worldwide web	52	.62	52	.69
3: E-mail	1	.69	52	.48
4: Word processing	51	.72	52	.32
5: Advanced word processing	18	.63	22	.40
6: Advanced operating	15	.51	52	.19
7: Overall	75	.71	52	.49

NCP project task completion rates are reported for children and youth completing assessments June 2002. Means are weighted averages for all grade levels combined. The smaller sample size for advanced word processing (N=22) indicates this section was only completed by grades 6 and up.

Limitations of findings. The findings reported in this study are limited in that they are scores from an initial testing of youth lab participants, and therefore only provide a baseline for measuring computer skill development. A baseline is a useful first step in measuring changes in computer skill development over time, but does not offer the same rigor as results of pre- and post-test measures or multiple data collection points (NCP sites used the computer skill assessment as a pre- and post-test in six month intervals). Future iterations of the computer skill assessment are planned for VISTA sites to allow analysis of skill development in youth lab participants over time.

Part 2—Evidence for Academic and Social Skill Development

The data collection. To examine the evidence for academic and social skill development in youth participants of after school computer labs, qualitative data was analyzed from quarterly progress reports completed by AmeriCorps*VISTA members and their extension supervisors. Quarterly progress reports are the primary tool VISTA uses to monitor projects and report impacts. Narrative progress reports require local projects to assess their quantitative and qualitative achievements on quarterly work plan objectives aimed at impacting poverty.

The method. Quarterly progress reports were obtained from 2002-03 from each of the four sample counties. Researchers used document analysis to identify and code VISTA member observations of skill application and content learning. Each coded item was later grouped according to the likelihood that the skills in use will be transferable to performance in school. Presented in this report are instances in which skill application and content learning are very likely to translate into improved academic performance. While the study stops short of addressing actual improvements in school performance, it does provide an important step toward future research on connections between technology-based lab activities and measurable success in school.

Anecdotal evidence. The strength of anecdotal evidence lies in firsthand observations of skill development and application by VISTA members who regularly work with youth in lab programs. The acquisition and application of new computer skills may be less discernible to school age care personnel who do not observe youth at work in a lab setting, to parents whose children do not have access to a computer in the home, or other informant groups. Following are evidences of documented skill application and learning from the sample lab sites:

"The kids work primarily with educational games since this is the summer time. They seem to be really enjoying the technology and are learning a lot about computers even though the games are fun." (Polk County)

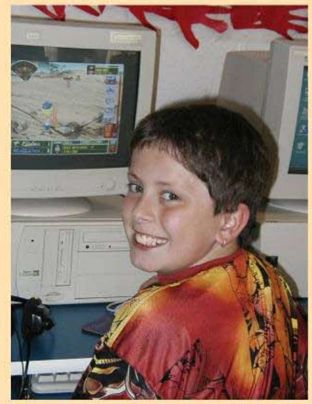
"With the Middle School, the kids decided that they were going to create a newspaper and they did so. Jacob and the VISTA helped them decide what they needed to put into the newspaper and each of them took part of it and then Jacob was to put it together. There were articles about the lab (software that is available, the instructors, etc.), pictures of the lab and of course, advertisements that were made up completely by the kids! They seemed to really enjoy this activity and it will be a good thing to keep up with the next school year, as we could keep it going continuously. In the lab they used paint software that comes with Microsoft Works (for advertisements and headers) and we used Microsoft Word for the word processing parts." (Callaway County)

"The low-income youth are very enthusiastic about the computer labs and seem to really enjoy the projects that they are working on...Incorporation of the Internet and 4-H has been underway to get the kids more familiar with the Internet and 4-H…at FMS Lab, a Parent/Teacher Night has been developed and students are making their own interview questions up and then will be compiling information collected for a PowerPoint presentation." (Callaway County)

"We have three youth volunteers that are also members of the Boys and Girls Club that were eligible for "The Youth of the Year" Award. All three members have volunteered time in the computer labs and share their feeling of the importance of the computer lab project in their award applications. These youth range from 16 to 18 years old. They are eager to teach the younger members skills on the computer. If staff is having a problem with the computers they assist them in that area as well." (Pettis County)

"The 'Techno Leaders' computer group [is using the 4-H *Computer Mysteries* curriculum and] the students are on Level 2 at this time. This level allows the students to get online and go through lessons…The group has started a Power Point presentation to promote the computer lab and its resources. The students have designed "The Member of the Week" certificate, using Print Master Silver [and have] networked one computer on DSL internet. This allows students to [do] research for school and other projects." (Pettis County)

Anecdotal evidence (continued)



"The first day of [computer lab] there was a child who can't read that was trying to play typing soccer. I read him the directions and he still could not figure this game out. After a while longer and me urging him to keep trying, he shouted out real loud ['SCORE' and 'GOAL']. He had figured out how to play it and was so proud...One of the teachers never used the computer lab as a resource. She didn't take the class in to use the lab. [Now] she has started to use it as a resource and looks to me for advice on what to do next." (Madison County)

"The kids spend the first 30 to 45 minutes working on their homework. [Then] they are allowed to play educational games on the laptops...purchased through the 4-H Foundation grant." (Polk County)

"We did have two groups of children involved in making Power Point presentations. This is something we have not done before in the lab. Several of the children involved had been to the 4-H Cyber Workshops in Mexico earlier this year and had worked with the program before. A few had not, so this was the first time for them. They created layouts of what they were going to say during the presentations and made their presentations, all with help from tutors. They then presented their creations, which was the first time any of them had done anything like this." (Callaway County)

Discussion and implications

The findings from this study lend credibility to the DESE/4-H After School Computer Labs Project as a model for boosting the computer literacy of upper elementary and middle school age students after school. The majority of students who regularly participated in lab programs showed gains in basic technological competencies such as operating a computer, using a word processor, and searching the worldwide web for information. Students are increasingly called upon to use skills such as these in the classroom, whether for conducting research, writing papers, or completing group assignments. Exposure to computers through after school programs can be a powerful supplement to school-based learning, and can help build a base of technology experience that will enable students to be more competitive when they enter the workforce.

Another implication brought to light is the importance of after school programs having access to basic technology services, namely connections to the Internet. A number of after school computer lab sites in this sample did not have an Internet connection. Recent surveys show that rural communities and less affluent areas, such as those represented in the sample, often lag behind in the "digital divide." Without web access, lab programs are limited to offline activities, which narrows the path of computer skill development. Internet access is a basic need if technology-based after school programs are to prepare students for success. Local, state, and national partnerships that remove barriers to access and bridge the digital divide are paramount. Whether bringing wireless access to inner-city neighborhoods or delivering dial-up access to remote rural schools, basic services are essential to expand the horizons of computer-based learning.

Related to technology access is the implication of how computers are used in after school settings. One study compared computer usage in schools in more affluent communities to usage in more impoverished communities (Foss, 2002). Researchers found that how modern computer equipment was used did not affect student learning as much as *how* effectively computers were used. Students in more affluent schools were observed using computers to create programs, do multimedia projects, do online research, do creative writing, and connect with other children. Students in less affluent schools tended to use computers more for "drill and practice." Even in under-resourced areas, technology-based after school programs can enhance student learning by adding in creativity and play-based learning.

Finally, the study also has implications for program delivery of after school programs incorporating technology as the medium for learning. Building on strong local partnerships between county extension offices and community-based organizations, sample sites utilized AmeriCorps*VISTA workers to implement lab programs. As a program delivery mechanism, VISTA brings dedicated time and human resources to often under-resourced after school programs, at a fraction of the actual cost. VISTA volunteers concentrate on starting and expanding programs, and building the capacity of host agencies and communities to sustain programs. Communities utilizing this strategy are likely to see increases in the number of students participating in after school programs, as well as increases in community volunteers and in-kind support for computer lab programs. The challenges to this approach include maintaining continuity with one-year VISTA assignments, staff turnover, and partnering with grassroots groups who typically do not have capacity to conduct program evaluation research.

Recommendations for research

The findings of this study reinforce earlier research on the development and application of computer skills by youth lab participants. Moreover, the evidence suggests that the time youth spend in after school computer lab programs is worthwhile, and may likely lead to measurable improvement in school. In light of these findings, it is recognized that further research is needed to demonstrate the impact and value of technology-based after school programs to youth, parents, schools, and communities. For instance, future inquiry could be directed toward:

- Measuring variations in math and reading scores between students who have participated in technology-based after school programs, and those who have not.
- Establishing connections between computer skill acquisition and application in lab programs and improvement in quality of work on school-related projects.
- Documenting the effectiveness of in-lab projects and activities in building specific academic competencies, such as typing or spelling.
- Identifying how youth gaining proficiency with certain educational software titles and theme areas effects student conceptual knowledge and understanding, on topics such as anatomy, business, or engineering.
- Exploring the influence of technology-based after school programs and related extracurricular activities, such as 4-H, on youth college and career choices.

Conclusion

Missouri 4-H, the youth development program of the University of Missouri Extension, works hand-in-hand with state and local agencies, community-based organizations and volunteers, and other youth development partners to identify the needs of Missouri's youth, and to plan, deliver and evaluate educational programs that meet those needs. As part of its commitment to provide research-based information and resources to assist citizens in improving their lives, Missouri 4-H will continue to play a role in research and evaluation that addresses these and other pertinent topics.

The DESE/4-H After School Computer Labs Project is one initiative addressing the disconnect between youth who have discretionary time after school and limited opportunities to learn with technology. Partnerships between government agencies, youth development programs, and communities go a long way toward ensuring kids stay safe after school. With the support of local schools, after school providers, and parents, technology-based after school programs can go a step further by creating opportunities for youth to discover and explore, "brightening horizons" for education and career choices down the road.

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Citations

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