JOHN W. GARDNER CENTER
for Youth and Their Communities

Integrating Technology into Community Youth Research

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The Emergence of Technology in Youth Development Programs

As access to computers and the Internet has increased in recent years, a number of youth development organizations have explored how technology can enhance their programming. They have investigated the worlds of multimedia design, computer programming, and even the formation of community business enterprises. The Boys and Girls Clubs of America, 4-H, and Girls Incorporated all have developed major technology initiatives in the past few years. At a policy level, organizations such as the Benton Foundation in Washington, D.C., and the Children's Partnership in California have been advocating for greater equity in technology access among youth.

A chief goal for many early initiatives of youth development organizations was to increase digital equity. Low-income, African American, and Latino families are all less likely than more affluent and White families to have a computer and Internet access at home. The schools that low-income youth attend tend to provide more basic, introductory experiences with technology —keyboarding and drill-and-practice games, for example—while schools that more affluent students attend are more likely to use technology to promote more advanced technical and problem-solving skills. Clearly, much could be done to improve access to computers and the Internet and to increase learning with technology by providing youth experiences within the community-based youth organizations where they enjoy spending time already.

Although commitment to the goal of digital equity is high among youth development organizations, widespread integration of technology into youth development programs is still rare. Just as classroom teachers have struggled to integrate technology into teaching in schools, youth development workers have found it difficult to find ways to use technology in their programs. Like teachers, program staff may have few opportunities to learn how to use the technology themselves for their own purposes. They may have minimal access to successful examples of projects that work well with young people like the ones they teach. Youth development programs themselves may not have the information needed to make wise decisions about obtaining and using software and hardware or the resources to support equipment maintenance and professional development.

In this issue brief, we explore some entry points for youth development organizations seeking to find ways to integrate technology more fully into their programs. We draw on the experiences

"What we have before us are some breathtaking opportunities disguised as insoluble problems."

— John W. Gardner

Increasingly youth development programs are exploring how to integrate technology into their activities. In this issue brief, researchers from SRI International describe a joint project with the John W. Gardner Center for Youth and Their Communities aimed at using technology to give youth more active roles in data collection and analysis. The project illustrates what programs can expect as they begin to explore how technology might help youth develop research skills and support the design of influential presentations of findings to the community.

of a new collaborative partnership formed between the John W. Gardner Center for Youth and Their Communities at Stanford University and a group of researchers affiliated with the Center for Technology in Learning at SRI International in Menlo Park, California. The collaboration began in 2002 to explore how new technologies might be introduced to support the community youth research process of the Gardner Center's Youth Engaged in Learning and Leadership (YELL) project.

We begin by describing early decisions about how to best structure technology experiences for youth. We then discuss some of the technology-supported activities in greater detail and some of the challenges faced in this work. Last, we consider some implications for designing technology learning experiences with and for youth.

Defining the Opportunity: How Might Technology Make a Difference?

In summer 2002, the Gardner Center teamed up with the Center for Technology in Learning (CTL) to develop a strategic partnership focused on the use of new information technologies to support YELL's model of youth-directed, advocacy-oriented research. Researchers at CTL engage in a number of research and development efforts aimed at using technology to support learning (for more about CTL, see http://ctl.sri.com). CTL researchers wanted to work in partnership with youth and staff of YELL to design and test new ways to introduce software and hardware tools into the context of YELL's ongoing research projects.

SRI and YELL have engaged in a process of *co-design* of technology-supported learning opportunities. In co-design efforts, researchers identify problems participants and staff feel are real and important. Jointly, they devise projects that may involve the use of existing technologies or the design of new technologies to address those problems. Co-design means that youth participants and adult staff of youth development programs engage in making the decisions for introducing technologies—what, when, and how. In that respect, co-design has a philosophy that is consistent with the youth development approach that places a premium on participant input and involvement as critical features of program design.

This co-design experience demonstrated that new technologies can be disruptive to programs when they are first introduced. They make new demands on staff and participants. They alter the flow of activities. The technologies have to be learned, and the equipment requires maintenance and support. Introducing a technology into an already successful program, then, requires a collaborative approach to ensure that important needs are addressed and to help program staff define their goals for technology integration. Once formed, the collaboration needs to take small steps to introduce technology—with time for reflection and evaluation—before taking on larger efforts.

At the outset of the co-design effort between SRI and the Gardner Center's YELL program, both access to technology and opportunities to learn how to use technology were limited in the West Oakland and Redwood City neighborhoods YELL serves. Few youth participants had access to computers and the Internet at home, and school access was limited to weekly trips to their schools' computer labs. Program staff at YELL had had limited experience with integrating technology into program activities. On their own, YELL staff had investigated possible ways to use technology tools to support youth research projects, but they expressed frustration about exploring these tools on their own, with limited support for designing activities that use technology in meaningful ways.

The collaboration identified an important limitation of the current research process for youth: YELL participants were not themselves actively involved in preparing data and investigating the data for trends and patterns. In the previous year, youth conducted a single large-scale, paper-and-pencil survey of the entire school population and a few local community members. Gardner staff managed the data entry off-site, and they conducted analyses using professional statistical software, such as SAS and SPSS. Youth were presented with the resulting statistical summaries, and they discussed possible meanings of the results with YELL adult staff. As a consequence, youth had only limited opportunities to actively explore and understand the data.

SRI researchers suggested that this approach to community surveys might be significantly improved with various technological tools to provide youth with a more active, minds-on research experience. In August 2002, YELL staff and youth were given a demonstration of Tinkerplots—software currently under development at the University of Massachusetts and designed for use by young people to aid in data analysis—and handheld computers loaded with survey software, a GPS digital mapping application, and a digital camera attachment. Both youth and adults were enthusiastic about each of these tools. They saw the most immediate value in collecting new data with handhelds and using Tinkerplots for data analysis. Over the next few months, plans were developed to introduce these tools to youth in the West Oakland YELL program.

There were two chief concerns of youth staff on the project. First,

they were concerned about the amount of time introducing the new technology would take up within the project. Based on their past experiences, too much time was required to learn the new technology, prepare activities, and actually orchestrate the activities. Second, they wanted to make sure that the project would help them become more fluent in the new technologies so that they could integrate technology into their own research projects as they saw fit.

Based on these concerns, a decision was made to structure the collaboration so that a CTL researcher would work in close partnership with YELL staff to design and co-lead technology-supported activities within the project. The collaboration would need to draw on the technological expertise of CTL staff, while also drawing on YELL staff members' sense of what kinds of activities would excite youth and be feasible to implement. Small "bite-sized" experiences with technology would give program participants a sense of the potential of technology without overwhelming them with complex, hard-to-use software.

Initial Experiences with Data Analysis Software: Tinkerplots

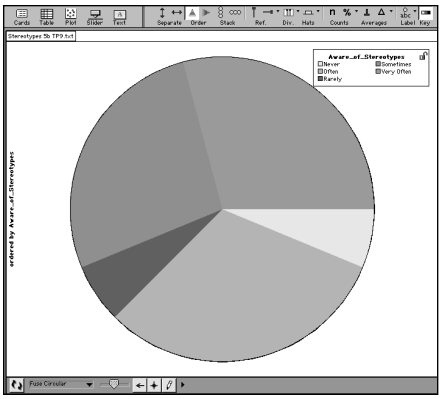

Fig. 1: *Pie chart created with Tinkerplots software—one of several types of data displays that YELL youth participants constructed to explore their survey results.*

In January 2003, after YELL youth had settled on stereotypes of young people in West Oakland as a research topic and had begun to learn about various research methods, CTL staff conducted a series of three lessons to help the youth researchers understand how to write survey questions by analyzing the previous year's survey data. Tinkerplots activities with both an instruction and exploration component were designed. Preparation for the activities included carefully structuring a small subset of the data to be interesting to youth and to reveal important patterns in the data. This step was critical, because many datasets—including ones that youth are likely to collect as part of their research projects—do not always show interesting and readily visible patterns that are amenable to analysis. Young people (and adults) often have trouble interpreting such datasets unless they know how to use fairly sophisticated statistical techniques to separate the "noise" from the "signal" of the patterns in the data (Konold & Pollatsek, 2002).

"[Tinkerplots] is…a nice method, a nice, different way to have your results—nice to look at." (Bianca)

The first lesson began with a short demonstration to illustrate two particularly powerful aspects of the Tinkerplots software. In Tinkerplots, data points can be represented as color-coded symbols (various sized circles or dots, squares, or other images) and can be moved and grouped according to a basic, intuitive set of operations, such as "stack," "order," and "separate" (Konold, 2002). These operations allow users to make more visible patterns in the data that might not otherwise be noticed. For example, by assembling quantitative answers to a survey question as stacks of data points, more frequently-occurring answers appear taller than less frequently-occurring answers. Depending on their focus of interest, youth can easily move the stacks around, fuse them into bar graphs, or transform them into pie charts.

Youth then worked in groups of two or three, first to explore the software's functionality in an activity called the "12-Button Discovery Game." Next, they used their newly gained skills to examine the data in a more meaningful way. The activity sheet for the "Count Something" game provided three sample research questions and answers involving basic descriptive statistics (e.g., "How many students were in grade 10?"). Youth were asked to write a similar question and find the answer with Tinkerplots. Examples included "How many people under 20 took the survey?" and "What percent of students say their teachers respect them?" At the end of this process, several youth volunteered to present their findings to the whole group using a computer connected to an LCD projector.

By using YELL data from the previous year and carefully selecting and structuring a small subset to work on, an activity that the youth would perceive as authentic, relevant, and engaging was constructed. Different teaching strategies—direct instruction and open exploration of the data—were utilized and combined within the same session. And in choosing to introduce Tinkerplots—a powerful but relatively accessible tool—first to youth, staff learned along with the youth, and hence, the groundwork for building the project's capacity for expansion of data analysis in the future was laid.

To expand the authenticity and pedagogical approach, in the second session youth were asked to write and conduct their own

survey and analyze the resulting data. They divided into five groups and wrote two survey questions each. Examples included: "Do you feel like after school programs make a difference in your community?"; "How much power do students have in the community?"; and "Do you think the media portrays West Oakland youth negatively?" YELL staff and the CTL researcher assembled these topical questions along with background questions (e.g., age, ethnicity, neighborhood) into a 21-question printed survey and distributed copies to the youth. The next day youth returned 50 completed surveys. The adults then entered these data into an Excel spreadsheet and formatted the dataset for Tinkerplots. An important aspect of this preparation was crafting variable names that were succinct enough to be displayed clearly in Tinkerplots while also being descriptive enough to be understandable by the youth.

In the third lesson, youth worked in their groups to analyze the data returned from their survey questions. Each small group then presented their results to the others. In an attempt to engage youth in their peers' presentations, audience members were asked to take on the perspective of a famous media celebrity (e.g., Oprah, Tom Brokaw) as they listened to each presentation and asked questions. Although it was a goal to have youth explore survey results collaboratively, the audience did not ask about the data during these presentations. Nonetheless, several spontaneously offered comments to a presenter on how to use the Tinkerplots software ("Just click on 'AGE', ya'll") and challenged the accuracy of the analysis. Most conversation during the presentations began with an adult question and included a response from the presenters, audience members, or both. In several cases, adults asked questions about how youth might apply their data analysis toward an advocacy project. For instance, in one of the more sustained discussions, a presenter showed that 51 percent of people surveyed believe the "media portrays West Oakland youth negatively." An adult asked, "What would you do to see if those people were right or not?" As the presenter pondered, another youth in the audience made the suggestion to "tape the news" to count the number of positive and negative references to youth. Another adult then asked how many respondents were students, and the presenter used Tinkerplots to conduct further analysis on the spot. Later, there was a follow-up discussion among two youth and two adults about how data on media stereotypes could be used in a YELL project.

The strategy for the second and third sessions was to foster deeper understanding of the data analysis tools and process by having youth apply what they had already learned with Tinkerplots to new data. Further, it was hoped that the authenticity of this new application would be especially salient to youth since it involved data from questions that each small group had written. Finally, the youth were asked to present their findings to the whole group as a way to engage them in social processes of learning about the meaning of the data, and to rehearse the sort of public explanation of their research that they would later employ in their community presentations.

"Last year we had surveys and we got the results back.… It was so much more difficult to understand….I didn't understand what half the stuff meant, but with [Tinkerplots], it's so much more easy, so much more clear, and it's so much more creative and colorful." (Bianca)

These initial efforts at achieving authenticity and attaining high levels of engagement were met with mixed results. The first session was quite a success with the participants; youth were excited to look at last year's data and explore it using Tinkerplots. These data were perceived as both real and relevant to their own efforts in researching their communities. However, in the third session when the youth were presenting their findings to each other, young people seemed only partially engaged in thinking through the presentations of their data, and their peers were only partially attentive to what they had to say. The process of preparing and delivering each presentation took much longer than the first day's presentation, since it required all groups to participate instead of just a few. Second, since presentations were mandatory, they included groups who did not feel as successful or enthusiastic as the youth volunteers in the first session. Third, the audience roles were not perceived as being very authentic. Many youth did not know the celebrity characters well, and they were not given the opportunity to prepare for their roles. Fourth, the youth facilitator that day was upset with events that had occurred earlier and felt that the YELL program was not going to make a difference in her school.

Introducing Handheld Software for Survey Data Collection

In the survey just described, a judicious approach to technology integration—using the more familiar paper-and-pencil survey format and delaying the transition to electronic versions—was employed. However, after the youth had become familiar with Tinkerplots and the process of conducting a mini-survey, we introduced handheld computers as a tool for data collection for a survey addressing the YELL youth's campaign topic. YELL staff

began several weeks earlier by giving each youth one of several handheld computers awarded to the program by Handspring Foundation for use in the project.

Fig. 2: Sample question from the survey conducted by YELL youth participants, as displayed by the Techneos Pro for Palm OS software.

In late April, CTL researchers and YELL staff discussed whether a small survey would support the youth's project work and decided to approach the team of YELL youth who were working on a magazine. The "magazine group" agreed and two members volunteered to work with the CTL researcher to design a new survey. Based on previous surveys and interview guides from other groups, two draft surveys on the topic of stereotypes were written, one for youth and one for adults. The youth then edited the surveys into their final wording. Using Entryware Pro Designer and Entryware Pro for Palm OS software donated by Techneos Systems Inc., the CTL researcher combined the two versions of the survey into a single branching survey for the Visor handhelds. Six youth volunteers soon collected a total of 48 surveys from other students, school staff, and community members.

Fig. 3: YELL youth participants, Brytteni and Monica, trying out a survey on the Visor handheld computers.

To support long-term capacity-building in YELL, the CTL researcher then worked with the YELL program director to train her to use the survey software and prepare data for Tinkerplots. Working collaboratively, they crafted a Tinkerplots dataset for the youth to analyze. The CTL researcher then worked with the two "magazine group" members to examine the data, select interesting results, and prepare 14 data displays for possible inclusion in the magazine. These included 10 single-variable displays illustrating a range of reported background data (e.g., ages, ethnicity, residence) and responses to stereotype-related questions (e.g., "Stereotypes of West Oakland Youth are a problem."). The data displays also included four 2x2 matrices comparing how survey answers differed by background (e.g., "stereotypes are a problem" x "ethnicity"). The director wrote an activity sheet with a series of questions and suggestions to help the youth structure their data presentation and interpretation for the magazine article.

"The visor was easier; it attracted more people….When I went around with the Visor, people started telling other people about how they took the survey on the Visor….It got a lot more people to take it rather than taking the same old boring paper survey." (Travell)

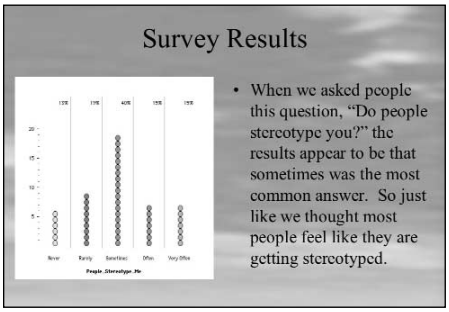

Fig. 4: Slide from a PowerPoint presentation by YELL youth participant, Tannak, at the Community Forum in June.

One of the youth then took responsibility for writing the article and received coaching from the SRI researcher and feedback from other youth and the director. Since several of the writer's peers seemed confused by the meaning of the 2x2 matrices, he chose to report on two single variables: 1) awareness of stereotypes ("I am aware of stereotypes of West Oakland youth") and 2) need for positive images ("Media should show more positive images of West Oakland youth."). Over the course of two weeks, with several cycles of feedback and editing, the writer's initial rough draft grew into a coherent, data-based argument for "more positive reports about West Oakland youth" from local media. The article appeared along with other YELL articles in the school magazine, which was distributed to the school and local communities.

Handheld-collected survey data also appeared in a presentation at the YELL Community Forum on June 10, 2003, where youth presented their work to approximately 60 members of the school and local communities as well as media reporters. In a PowerPoint presentation entitled "A Summary of YELL Research," one of the youth discussed plots representing results from two survey questions (see Fig. 4). First, he addressed the question, "Do people stereotype you?" and noted that the most common answer (40%) was "sometimes." Second, he reported that the "Media" was the most common reply (42%) to the question, "Who stereotyped the most?" As a result of the Community Forum, a local newspaper and television outlet both reported on the YELL program's year-long investigation of stereotypes.

Later, during the summer YELL program, two youth used Tinkerplots to analyze the annual school survey. In contrast to the previous summer, when adults analyzed data off-site and the YELL director worked with youth to interpret the statistical printouts,

Fig. 5: YELL youth participants engaging peers and adults in a small group discussion at the Community Forum.

these youth worked independently. Provided with a properly formatted data file, they were able to tally results from the survey with no adult help and report their findings to the director.

In future sessions, it is anticipated that these and related skills will become an additional resource for the West Oakland YELL program and will provide further leadership and learning opportunities as new youth join their more experienced peers in another round of community research.

Implications for Integrating Technology into Youth Development

Finding the right way to incorporate technology in ways that are authentic to youth's experience can prove challenging. When exploring data they care deeply about—such as patterns of respect among students and staff in their schools—the data analysis process can feel exciting to many youth. But focusing on data analysis when youth are actively questioning the role of research and technology in helping them change their communities can be counterproductive. Engaging with their sense of powerlessness and discussing the role research does and doesn't play in informing policy may be a much more powerful learning experience for youth.

Another challenge is the time needed to structure data analysis activities. Although the project discussed in this paper produced lesson plans that can guide future efforts, these plans cannot provide locally relevant data that feels "real" to other youth. The task of selecting and shaping a dataset for youth to successfully examine takes a moderate degree of skill and effort. Tools like Entryware Pro Designer make the task of survey writing relatively easy, and survey software on a Visor or other handheld computer can significantly streamline the flow of data to a usable form. Nonetheless, achieving authenticity of data analysis is likely to depend on careful attention to the specific interests of particular youth. It is our view that supporting youth in a meaningful process of data collection and analysis is worth the effort when it occurs in the context of a project that youth experience as real and a catalyst for change.

"I felt like they were pretty engaged. It was when they had to present back that it got a little more challenging. I think that has to do with presentation skills. I also think it has to do with their analysis skills. Like running the frequencies is relatively easy for them to do, and to play with the buttons and see different ways of making it look cool. But in terms of explaining what's happening on the screen and what that means, that was a weakness. Not necessarily of Tinkerplots, but of where they are at in terms of their analysis, and we need to figure out how to help them do that better." (Yolanda Anyon, West Oakland YELL Project Director)

Three aspects of the co-design efforts described in this paper help explain how the YELL experience proved to be a good starting point for technology integration. First, the YELL—SRI collaboration began by developing a technology plan and building a support team. This step ensured that technology experts, researchers, youth development staff, and youth themselves shared an understanding of the important problems the technology might address. It also gave staff a chance to say where they needed help from technology experts and identify the level of expertise that they desired. Second, aspiring to authentic use of technology consistent with the program's goals and approach to youth development was agreed upon early in the process. The research process of YELL, which was already youth-driven, was enhanced by giving youth more control over the process of data analysis. Finally, the process began with tools that would be easy for staff and youth to learn and use. Both Tinkerplots and Entryware Pro can be learned quickly in just one or two sessions. Though simple to learn, they provide easy access to powerful data collection and analysis methods that may be beyond the reach of what youth can do with pencil and paper. Thus, these software tools have great potential to enhance learning and development.

Youth development organizations today play an important role in providing young people opportunities to develop a healthy and positive sense of self through participation in authentic activities. These activities offer youth a chance to feel competent and to take on responsibility for projects that typically culminate in public performance and serve as tools for social change. Youth development organizations employ a number of tools to promote youth voice and ownership of the project process. As these initial efforts show, technology can be effective as one of those tools.

Ensuring that technology plays a useful role within a youth development program, however, is a difficult task. It requires careful attention to designing authentic tasks, a willingness to reflect critically on unsuccessful aspects of technology implementation, and careful planning for sustainability. We believe that each of these requirements can be met and that the payoff for youth development programs in general, and community youth research projects in particular, is significant.

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For more information about the Gardner Center or the YELL Project, please visit our website at **http://gardnercenter.stanford.edu**

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The John W. Gardner Center for Youth and Their Communities was founded upon the values, principles and vision of John Gardner—a strong belief in society's potential and in the potential of individuals as well as institutions; a commitment to renewal; and the optimism to think in possibilities, rather than obstacles.

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