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Science Learning Network: Research Memo

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Research for Action

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Introduction

Research for Action (RFA) is pleased to share what we are learning about the Science Learning Network (SLN) with members of the Alliance and their partner schools. This memo is based on data collected during the spring of 1995 when school-museum relationships were just being established. During this time period, each SLN team, as well as the Alliance as a whole, was still at an early point of development. During this period, Alliance members have remained enthusiastic and committed to this demanding project, as they take on the challenges of developing partnership.

The memo is written for internal use by SLN Alliance members and partner schools. During the period of research, many aspects of SLN's role within each museum were still in flux, and its direction within each school was at the early stages of negotiation. In the memo, we look at variation among both museums and schools in the Alliance in order to begin to identify some of the contextual features which may shape the development of SLN within each local situation. The purpose of the memo is to share information across sites and allow program planners to make adjustments in context where desirable.

In the memo we address the following three questions:

- What is the range of variation among museums in the role, vision, and location of SLN?

- How do the Alliance museums perceive their relationship with each other and with Unisys?
- What is the range of variation in the process of negotiating school-museum partnerships around telecomputing and inquiry learning?

Finally, we reflect on the implications of this data for the Alliance as a whole by addressing the question:

- Given this range of contexts and experiences, what do we see as opportunities, challenges, and questions for the Alliance?

Methodology

The primary data for this memo is drawn from 19 telephone interviews conducted during April-May 1995. RFA staff interviewed the principals of the six demonstration schools, five SLN project directors, two resource coordinators, three department heads of education who are not SLN staff members, and three other museum staff. In some cases SLN staffing was not finalized at the time of the interview. In each case the interviewer followed an open-ended interview guide designed to be used with either museum staff or school staff. The analysis contained in this memo also draws on face-to-face meetings with The Franklin Institute staff, Alliance meetings in Philadelphia, SLN's monthly phone conferences, written documentation, and to a lesser degree, SLN e-mail exchanges.

What is the range of variation among museums in the role, vision, and location of SLN?

This set of data indicates that most of the Alliance museums are in a period of flux as they begin to introduce telecomputing and inquiry learning into their organizational culture. Because SLN challenges each museum to integrate a project which spans traditional departments, the initial data suggest that SLN carries tremendous potential for influencing the overall structure and vision of museums. In order to maximize this

potential, museum staff should think about the strengths and drawbacks of various organizational structures and staffing patterns.

As the program evolves, RFA will continue to observe and analyze how SLN's positioning within each museum relates to its potential impact on the overall organization and vision of the museum. At the present time, three dimensions of variation of SLN's positioning within museums emerged as important in our analysis of the data:

- The degree to which the SLN staff are concentrated in one department or are spread throughout the museum.
- How SLN negotiates its role and status in relation to traditional museum departments.
- How SLN functions as an integrative vehicle within each museum.

Interviews with museum staff and written documents indicate that SLN staff are positioned in a variety of places within the organizational structure of the six member museums. SLN staff are variously located in Education, Finance, Media and Library, and Exhibits or Programs. Although most of the museums have a concentration of SLN staff members within their Education departments, staff crossovers between departments indicate that SLN does not fit into the existing departmental structures. For example, in Minnesota, the SLN team consists of staff from two different Education divisions (Computer Youth Center and School Services), as well as staff from Museum Programs. Illustrating another form of crossover, SLN at The Franklin Institute is based primarily in Finance, but also draws heavily on the staff and resources of the Education Department.

Even if the SLN staff are located unambiguously within Education, they often work closely with people from other departments on the development of on-line resources. For example, in Miami, the SLN museum-school coordinator and asset development manager both report to the head of the Education Department, yet the Director of Exhibits is also working on resource development. According to Judy Brown, SLN program director in Miami, "In reality, if everybody could, everybody would be involved in SLN."

While SLN draws on staff and resources from across existing departments, it is also negotiating its role and status in relation to these departments. As with staffing patterns, SLN's role and status has multiple variations. In one site, the Director of Education explained that several SLN staff members participated in the committee that identified museum-wide directions for telecomputing and that SLN is now playing the central role in the museum for carrying this out.

At other sites, SLN is still negotiating its role in relation to museum-wide telecomputing issues. For example, one SLN staff member commented that the project, located in the Education Department, was still disentangling itself from Museum Information Services and was working out "what are separate SLN issues" in relation to a pre-existing "home page committee." In several other sites, SLN staff have complained that they are buried so low within the hierarchy of a particular department that they have neither a voice nor authority to impact museum policy around telecomputing.

As they struggle with organizational issues in implementing a program that crisscrosses existing museum functions, museum staff also articulate varying visions of the role that SLN can play within their museums. Many people interviewed in this round of data collection were enthusiastic about SLN as a vehicle for integrating different parts of the museum, especially Exhibits and Education. However, others voiced concern about the dangers of diluting SLN's potential as it balances competing demands.

Many people interviewed during this round of data collection portray SLN as an integrative vehicle for moving the entire museum into the virtual world. For example, one project director commented that "SLN is a natural extension of where we needed to go and what we were doing, but at a higher level technologically." In her view, SLN has broken down some of the traditional barriers between education and exhibits as it acts as a "catalyst for communication between the two sides." At this site, "If everybody could, everybody would be involved in SLN."

Similarly, the Vice President for Education in another site, not an SLN staff member, reports that "SLN touches everything the museum does -- creating exhibits,

marketing programs, and community partnership." He stressed "the most significant piece of SLN is that it's an integrative project that spans across the museum."

While all museums in the Alliance are enthusiastic about the potential of SLN, several people caution against losing SLN's dual focus on inquiry learning and telecomputing. While SLN's goals of on-line resource development and work with demonstration schools make the program an integrative vehicle across museum departments, this same combination of program elements raises the possibility that the program's potential will be diluted. For example, one administrator warned against "simply developing technologically connected schools." He worried that the program would have difficulty developing "interesting resources that teachers can really use" at the same time that it "deeply affects" pedagogy in on-line demonstration schools. In another site a program coordinator expressed a similar concern that "scant resources would be developed" and that teachers would not have sufficient experience with inquiry-based science learning. In addition, staff people in several sites voiced the concern that as SLN helps museums go on-line, it faces the challenge of balancing conflicting goals for marketing and pedagogy in the virtual world.

SLN does not fit neatly into the existing departmental structures; it confronts each museum with the challenge of integrating a project that crosscuts traditional departments. Because it draws heavily on education, but spans the museum, SLN has the potential to restructure the position of education departments within their museums and the potential to impact the nature of the experience of museum's traditional clients, the visitors to the physical museum.

In addition to playing a role in integrating telecomputing into the museum experience, SLN is also developing knowledge about the relationship between inquiry learning and telecomputing based on its experience in schools. This suggests that SLN has the potential to impact the entire organization and vision of the museums in which it is located. As SLN forges new pathways between departments, it raises the possibility of making the entire museum experience more inquiry-based and lessening the difference between museum visitors and school clients.

How do the Alliance museums perceive their relationship with each other and with Unisys?

In general, members of the Alliance portray a productive tension between the individual museums and the collaborative effort entailed by the Alliance. Although staff people tended to focus on SLN's internal impact on their museums during these interviews, many also perceive SLN as "a strong relationship" and hope that the Alliance will be a "place where the whole is greater than the sum of the parts," that it can "help define what it means to be a good on-line resource," and that it can be successful in collaborating on programs and developing on-line resources.

Several staff members described a growing sense of the value of collaboration in spite of differences among the member museums. The tension between differences is evident in the following observation: "Every museum has strong individuals. These museums are going to go their own ways." However, others described a growing sense of collaboration. "At first it was frustrating in meetings because everyone has a different perspective. Now, I have come to value the diversity of people who are there." Similarly, another explained, "It's good to know the difference so we won't assume things. Collaboration is really hard. It would be easier to say, 'Let's do our own thing.'"

Several museum staff members also addressed the changing relationships between The Franklin Institute, UNISYS and the other member museums. According to one, there was an "us/them thing" between The Franklin Institute and the other museums, but that's fading now." Another valued the Franklin's effort, but explained, "I'd like other people to take the lead." Interviewed during the spring when the Franklin was still mediating Alliance-wide relationships with UNISYS, two museums also expressed their discomfort with the existing relationship, explaining that the trust level is not high between UNISYS and the museums." Later in this spring, SLN staff across museums seemed more comfortable with UNISYS as they developed links that did not depend on the Franklin.

What is the range of variation in the process of negotiating school-museum partnerships around telecomputing and inquiry learning?

Research for Action's initial conversations with school and museum staff took place when their partnerships were just beginning, a key moment for understanding how that partnership will evolve. These early conversations about the evolving partnerships suggest that the technology and resources of SLN will intersect in a wide range of ways with the needs and capacities of each school. This range of variation among the six museum-school partnerships presents an ideal opportunity to highlight the multiple ways that telecomputing can impact whole school change.

An intention of SLN is to create a set of schools which can serve as a testbed for demonstrating how telecomputing can strengthen the education for all kinds of students and how all kinds of students can use the resources of telecomputing in creative ways. Although the museum partners are situated in urban areas across the country, not all of the six participating schools represent an urban school profile. Looking across the six sites, however, the schools serve a wide range of students who vary on the dimensions of race/ethnicity, socio-economic background, learning and physical differences, and conventional achievement measures.

Chart I represents some of the variation within schools in terms of student population and in terms of resources for telecomputing. In the next several months, Research for Action will continue documenting this range of variation. In the next section of this memo, we examine the ways that museums, school districts, and schools negotiated the selection process.

In this project, Alliance museums used several processes and criteria as they entered into partnerships with schools. Some museums initiated an application process for schools in their areas, while others chose to work closely with schools with which they had previously established relationships. Of the museums which used a formal application process, several museums chose schools that showed enthusiasm, but had minimal

previous computer involvement. Other schools have more extensive experience with both computers and telecomputing.

In the Boston area, the principal at the Hosmer Elementary School in Watertown heard about SLN from her district superintendent, who had received an informational packet that was distributed to school districts throughout the area. The principal explained, "We weren't the most technology-oriented, but we had the drive to really go after it."

The SLN staff at the Boston Museum of Science perceived the faculty at Hosmer as "enthusiastic risk-takers and innovators." They described the principal as someone who "sees SLN as the first step in system-wide change" and looked forward to working in a school with a "fairly high proportion" of disabled kids who "generally do well with this kind of technology." In addition, in the eyes of the Boston SLN staff, Hosmer's impoverished state of technology made it particularly appealing compared to the other school that looked promising.

In Philadelphia, The Franklin Institute entered through the hierarchical structures of the school district's central office, was directed to two regions of the city, and constructed an RFP process that went to schools in those regions. The northwest region's superintendent was particularly excited about matching SLN with the Levering School, a school that had recently undertaken the development of a technology lab and in the meantime had undergone a change in leadership. She encouraged the school to apply and lobbied for it as an excellent possibility. The school interpreted her encouragement as both mandate and morale booster and worked hard to package itself as a viable and attractive candidate. For many reasons, few having to do with technology or science, the school was attractive to The Franklin Institute: "a real urban school," with a racially diverse student population; a K-8 setting; support from the district hierarchy.

In contrast, in Dade County, where the demonstration school was also chosen through a formal application procedure, the Miami Museum of Science received 33 applications from schools, and the staff felt that they had to pick a school which was already on-line. The Avocado Elementary school in Homestead, Florida was selected

primarily because of highly motivated teachers and its technological readiness. This school, which had a long-standing technology initiative, was devastated by Hurricane Andrew in 1992, and was rebuilt with an even more up-to-date technology. Teachers here have had intensive inservices in technology and they voted 100% to participate in SLN. The staff at the Miami Science Museum chose this school over another finalist school which had more experience with hands-on inquiry science, because in addition to demonstrating enthusiasm, "the network would be up and running" at Avocado.

The other three museums all chose to work with schools with which they had a previous relationship. Like the Avocado Elementary School, these three schools were already on-line.

The Museum Magnet School was "a natural choice" for the Science Museum of Minnesota. The entire building is networked and everybody is on-line, although not everybody is equally comfortable with the technology. The museum already has several staff members working at the school who work with teachers and students on school-wide thematic units that lead to the development of museum exhibits.

Similarly, the staff at the Oregon Museum of Science and Industry felt that "Buckman was our destiny." The arts magnet school was near the museum, and they had worked together previously. The museum staff was confident that a particular Buckman teacher with technological expertise would be an excellent resource for the project. This teacher and the principal led the school through the process of raising money to wire the school for networking. The school and the museum are, according to the principal, on the same wavelength, although the museum has more resources and knowledge.

In San Francisco, the Exploratorium chose to work with the Ross School in Marin County because it was seeking a school that was already "committed to telecommunications." The Exploratorium had worked with the school previously on telecomputing and staff development. One staff member at the museum hopes that the school can work on integrating the technology that they have into their curriculum while continuing to work with developing their pedagogy. Although the executive team of SLN did not initially like the museum's choice of school because it was not an urban school, the

museum staff feels that it was been a "great choice" so far. The school's flexibility matches with the museum's style.

Each of these schools presents a unique context for the development of SLN. Each school has its own projects and priorities which overlap in a variety of ways with SLN. However, SLN can also learn from the literature on school reform which warns that "projectitis," characterized by a multitude of uncoordinated attempts at innovation, cannot produce consistent, sustainable, and deep changes in curriculum and instruction needed to enhance children's achievement in school. In this project, many principals in participating schools have very general notions of the fit between SLN and other school programs and policies, but most have not yet done a lot of detailed strategizing about the relationship between SLN and other program priorities. Although Research for Action did not have an opportunity to interview teachers during this round of research, in our experience with other schools, teachers often find it even harder than administrators to mesh a myriad of conflicting goals and mandates.

SLN staff across the sites express a commitment to integrating the program into the cultures of their local schools. This commitment must be concretized in program planning together with the school . In spite of the goodwill on the part of museum staff, it is natural for them to focus on their program as a discrete entity. In the press of program implementation related to SLN's multiple goals, it will be easy for the museum staff to fall back on offering intermittent in-services or colloquia that do not help teachers integrate SLN into the ongoing work of the school. What is needed in these school-museum partnerships is a focused, coordinated, and ambitious effort that reaches into all classrooms. For this reason, it is important that each of the six sites develops a vision and a roadmap for telecomputing and an inquiry approach to teaching and learning that can cohere and inform other things going on in the school.

Given this range of contexts and experiences, what are the opportunities, challenges and questions for the Alliance?

SLN is introducing dramatic new technology into two different types of institutions, schools and museums. As everyone involved with the program realizes, this technology, if it is coupled with a pedagogical framework that stresses inquiry, has the potential to impact science teaching and learning in an extremely powerful way. In this memo, we have looked at variation among both museums and schools in the Alliance in order to begin to identify some of the contextual features which may shape the unique development of SLN within each local situation. At the time of this writing, many aspects of SLN's role within each museum are still in flux and its direction within each school is at the early stages of negotiation.

The Alliance has the potential to become a partnership in which members respect each other's strengths, skills, and differences. This round of data collection indicates that member museums are moving into relationships with each other and UNISYS that are no longer mediated primarily through The Franklin Institute. This suggests that the nature and identity of the partnership is now being co-constructed by all of its members. As people connect with each other in numerous ways, the Alliance is becoming an arena in which members value variation from context to context, but also an arena which provides member museums with knowledge about what is working outside of their immediate spheres. Rather than holding on to a single vision of SLN, the Alliance is beginning to develop multiple visions of how it will impact science teaching and learning.

In past quarterly meetings, conference calls, and electronic communication, Alliance members have begun substantive discussions across museums about resource development and inquiry learning. There has also been general discussion of the need for technological, pedagogical, and organizational change in order to reach the multiple goals of SLN. We believe that the Alliance members can now benefit from taking up several issues related to variations in local contexts.

First, the Alliance can provide a valuable forum for museums to address organizational issues which are bubbling up at this watershed moment for

telecommunications in the museum world. We believe that talking across museums would help each institution clarify the match between its own vision for SLN and the organizational context within which SLN is embedded. Issues for discussion during conference calls or quarterly meetings might include: the relationship between staffing patterns and the vision of SLN in each museum, the role that SLN plays for each museum both internally and externally, SLN's role in integrating different parts of the museum, SLN's status and its authority to make policy decisions within each institution.

Second, museums also face the challenge of catalyzing and supporting whole school change in a very broad range of school contexts. To address this, we suggest that museums directly address school change issues in summer institutes and school year colloquia in several ways.

Museums can introduce the topic of whole school change through such activities as *The Change Game* and lead discussions of articles related to school renewal/reform. A good starting place might be the article "Getting Reform Right: What Works and What Doesn't," by Fullan and Miles (*Phi Delta Kappan*, June 1992, pp.745-752). Museums can work with schools to consider how the ideas and philosophy contained in SLN fit and don't fit with what is going on in the school now and with initiatives that are coming on board. For example, SLN staff might create forums for schools to do such things as brainstorm connections, prioritize them, and develop a timeline for merging efforts.

Museums can also work with school leadership teams/councils consider how to develop and position leadership for the SLN initiative. Similarly, they can also suggest that the entire school staff consider how teachers will consult with one another and share expertise. In other successful whole school change efforts, teachers often engage in activities such as visiting one another's classrooms, co-planning instructional activities, units, and projects, and looking at student work together.

Conclusion

SLN museums and demonstration schools have taken major steps in developing the relationships that are necessary to fulfilling SLN's potential for integrating telecomputing and inquiry learning and dramatically impacting the teaching and learning of science. During the upcoming years of the program, RFA expects to see SLN's presence within museums solidify and its capacity as an alliance grow. Furthermore, we expect that the participating schools will develop into on-line schools which exemplify the plasticity of telecomputing as a pedagogical tool. In our future research, RFA will continue to explore SLN's positioning within each museum as well as the relationships between Alliance members. In addition, as we begin to visit summer institutes and schools, we look forward to learning more about approaches to science in each school and other contextual factors which shape the role of SLN.

Chart I: Current Information on Participating Schools

SCHOOL	Grade/ Org.	# of St.	Student Demographics	Computers and Related Technology	Resources for Telecomputing/ Telecommunication	School and District Level Staff Development/ Leadership	Uses of Computers/ Telecommunication
Levering School **(Philadelphia, PA)**	K-8	530	49% Caucasian 48% Af.-Am. 3% Asian/Latino Draws from blue collar neighborhood and low-income housing project.	33 Macs in computer lab. 12 Macs, IBM's in tech lab. Robotic arm in tech lab. Apple IIe's in some classrooms.		Computer science teacher provides staff in-service on computer use and supports teachers in using computers across the curriculum. School expects to train other teachers in its cluster in telecommunications.	Students learn Logo. 7th and 8th grade students work with computerized robotic arm. Some classroom teachers use computers for word processing.
Buckman School **(Portland, OR)**	K-5	542	72% Caucasian 11% Af.-Am. 7% Hispanic 6% Asian 4% Native Am. 48% of students qualify for free or reduced lunch.	1 computer in every classroom.	Every classroom networked and on Internet. 6 of 25 teachers have Netscape.	Principal and PTA raised money to get computers and wiring. Principal involved on district level telecomputing committees. Teacher resident at OMSI worked in telecomputing.	Webserver in one K-2 classroom. Camera focused on block area so students can reflect on the process of block building. Students in this class also present results of research projects on local network and World Wide Web. Students in other classes develop computerized multimedia presentations.
Hosmer School **(Watertown, MA)**	K-5	750	Majority Caucasian Large group of Armenian speaking students. 26 languages spoken in students' homes. Many mainstreamed disabled students.	30 Apple IIe's (in classrooms).	School has America on Line Account.	District level coordinator for technology has been attending SLN meetings. Principal anticipates Hosmer teachers will provide leadership for other teachers in the district.	Student work with Logo is integrated into thematic units. Some classes are involved with on-line Class Afloat Program or Mayan Expedition. Some teachers use National Geographic's on-line curriculum supplements.

SCHOOL	Grade/ Org.	# of St.	Student Demographics	Computers and Related Technology	Resources for Telecomputing/ Telecommunication	School and District Level Staff Development/ Leadership	Uses of Computers/ Telecommunication
Avocado School **(Homestead, FL)**	K-5	600	61% Caucasian 23% Af.-Am. 15% Latino 50% of students qualify for free or reduced lunch. Majority of parents are blue collar or agricultural workers.	250 computers (Macs, Apples, and 1 PC) in the building. 4 computers in each classroom. Mac production lab with color scanner, laser printers. CD ROM in media center.	Entire school is networked. Will be connected to local area network and wide area network. Mac production lab has Internet connection.	Principal solicited technology grants. Teachers trained on multimedia production tools, desktop publishing, administrative software, Internet, and using technology through the curriculum. Teachers proficient with equipment or software are resources for peers. Parents sought out grant for computerized phone system.	Old Apple IIe's used with "probeware" as adjunct to science lab. Media center card catalogue is on-line; students and teachers have access to CD ROM books, electronic encyclopedias, and interactive databases. Computerized phone system provides parents with information about assignments, lunch menus, and events. Teachers use computers for math (both drill and problem-solving), science, and word processing. Starting to use Internet. Planning to use internal e-mail for administrative purposes, for teachers and students to communicate and collaborate with each other.
Ross School **(Ross, CA)**	K-8	400	Mostly Caucasian Draws from area with high socio-economic status.	Teacher stations in every room. Other computers on carts travel from room to room.	All classrooms are networked. All classrooms have Internet access. Plan to have library networked.	School is an Apple Teacher Development Center. Teachers participate in week-long practicum in use of technology to enhance learning.	Goal for computer use is to embed it as a tool in learning. Middle school students have work on network. Electronic bulletin board project with Exploratorium.
Museum Magnet School **(St. Paul, MN)**	K-4 (adding 5 & 6 in another location)	336	52% minority (Af.-Am., Hmong, Vietnamese, Hispanic, Native Am.) 48% Caucasian	Computer lab. Computer in each classroom. CD ROM.	Entire building is networked. Video studio available to students.	Teachers trained in computer animation. Museum staff with technology backgrounds work on-site as resources for teachers.	Kindergartners do keyboarding. Older students do word processing and graphics. Students use computers, Kid Picks, Hyper-Studio, scanner, zap camera, and video studio for museum exhibits.