The Virtual High School Consortium

A Proposal for a Unique, International Cooperative that will Share Educational Resources Using the Internet.

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ABSTRACT

High schools face the dilemma of offering rich and challenging courses while providing a smaller, more intimate school environment. The Internet can solve this problem and bring a universe of virtual courses to any school. By bringing the world into schools, Internet courses can tap the knowledge and experience of corporations, universities, and individuals anywhere. Schools exploiting these resources can accelerate students' advanced study and integration into work and society while providing academic support as they make the transition to work.

While no one school has the resources to expand their offerings in this way, a collaborative of schools definitely can by pooling their strengths with the assistance of experts. Using the resources available on the Internet and organizing them into courses, cooperating schools can create a rich variety of high quality net-based courses they can all utilize.

The goal of this project is to create a national consortium of schools that expands members' curricular offerings through a wide range of excellent, current, innovative network-based courses that support reform. This will be done in a way that can scale and continue post-funding while spawning independent, parallel efforts.

The project will:

1. Create a large, diverse collaborative of schools that will share resources.
2. Provide high-quality, network-based professional development for participating netcourse teachers.
3. Develop and offer a wide range of excellent, innovative netcourses that take full advantage of the Internet and serve a diverse group of students.
4. Create a collaboration model that is feasible for all schools, scalable, replicatable.
5. Evaluate the project and its potential for wide-scale adoption.

The success of this project would have an impact far beyond the participating districts. Additional schools will want to join or create their own collaborative. To facilitate this, we will accept schools on a partially-funded associate basis and create regional groupings that could develop into independent collaboratives. To support this dissemination effort, we will engage a highly-experienced outside evaluation team to carefully document our progress. To help others, we will widely disseminate the evaluation results as well as project-generated curricula and technology.

ACKNOWLEDGMENTS

This proposal must represent an idea whose time has come, because it has generated unpresentented interest. The five weeks we allocated to the development of this proposal, while it represented a huge distraction and cost for our small non-profit, was far from sufficient. As a result, pulling together the Consortium was more haphazard than we would like, and some very important schools, universities, businesses, and people were inadvertently overlooked, leads were not followed, and people given impossibly short deadlines. To those whom we did not serve well, our apologies.

The organizations and people who did make it through this process make an impressive group and set of groups. Thanks to the work of several dedicated people who came forward to help, many of the schools are clustered into regional groups that can meet together and coordinate efforts. Four of these regions have substantial, independent support from businesses as well as associated universities that can provide preservice students and courses. In fact, we are so impressed by the power of the regions, that we are going to persue this with independent funding. To those who have helped formulate this idea and create regional groups for the VHS Consortium, we owe special thanks.

The VHS Consortium concept was developed jointly by Drs. Berman and me. I wrote the bulk of the proposal take full responsibility for the errors it contains. Dr. Berman of the Hudson Public Schools contributed the section on Hudson and phraseology throughout. Dr. Kozma of SRI International developed the evaluation plan with me and wrote both the evaluation section and the description of SRI. Heidi Forbes and Ray Rose of the Concord Consortium recruited the Coalition members.

Bob Tinker

Final VHS Clusters

Cluster One: North Carolina Virtual High School Consortium

New Hanover High School
Hillside High School
Robeson High School
Thomasville High School
Northampton High School
Myers Park High School

Cluster Two: New York/New Jersey

Union Hill High School
Columbus High School
Morristown High School
Collingwood High School
Roosevelt High School
Asbury Park High School
South Brunswick High School
Emerson High School

Cluster Three: Northeast

Alternative Community Schools (NY)
Delaware County Intermediate Unit (PA)
Radnor Township School District (PA)
Rutgers Preparatory (NJ)
Strath Haven High School (PA)

Cluster Four: Regional Math/Science Collaborative

Avonworth High School
Beaver Area High School
Brentwood Jr./Sr. High School
Gateway High School
Keystone Oaks High School
Seton-La Salle Catholic High School
St. Joseph High School
Canevin Catholic High School
Our Lady of Sacred Heart High School
Central Catholic High School
Vincentian Academy

Cluster Five: California

Campolindo High School
Casa Grande High School
Mendocino High School
Miramonte High School
Windsor High School

Cluster Six: Massachusetts

Hall-Dale High School (ME)
Hudson High School
Malborough High School
Shrewsbury High School
Westborough High School
Wilbraham Monson Academy

Cluster Seven: Southwest

Allen Independent School District (TX)
Center High School (CO)
Chama Valley Independent Schools (NM)
La Junta High School (CO)

Cluster Eight: Washington State

Gig Harbor High School
Quillayute Valley School District
Shoreline School District-
Shorecrest High School
Shorewood High School

Cluster Nine: OHIO

Wickliffe City Schools
Copley High School

Associate Members

Park View Education Center, Nova Scotia, Canada
Ascension Collegiate, Newfoundland, Canada
Otago Girls High School, Dunedin, New Zealand
Dunedin Institute for Learning, Dunedin, New Zealand
Walthamstow School for Girls, London, United Kingdom
Distance Learning Center, Department of Defense Dependent Schools

The Virtual High School Consortium

THE NEED

High schools face the dilemma of offering rich and challenging courses while providing a smaller, more intimate school environment. Many schools are pressed to make better curricular use technology but have limited technical expertise. Imagine that, without expanding, a school could double or triple its course offerings to meet the specialized needs of a wide range of students while improving its core courses. High schools have been constrained by the limited resources available within the building, but the Internet can remove that restriction and bring a universe of virtual courses to any school. By bringing the world into schools, Internet courses can tap the knowledge and experience of corporations, universities, and individuals anywhere. Schools exploiting these resources can accelerate students' advanced study and integration into work and society while providing academic support as they make the transition to work.

While no one school has the resources to expand their offerings in this way, a collaborative of schools definitely can by pooling their strengths with the assistance of experts. Using the resources available on the Internet and organizing them into courses, cooperating schools can create a rich variety of high quality net-based courses they can all utilize.

GOALS AND OBJECTIVES

GOAL

The goal of this project is to create a national consortium of schools that expands members' curricular offerings through a wide range of excellent, current, innovative network-based courses that support reform. This will be done in a way that can scale and continue post-funding while spawning independent, parallel efforts.

In effect, we will use the Internet to expand the offerings of consortium schools so they can realize the academic advantages of size without suffering the side-effects of a large bureaucracy and physical plant that make large schools undesirable. The shared resources – the Virtual High School Collaborative – will have the enrollment and teaching expertise needed to offer a wealth of courses serving all students that will be the envy of any school. The VHS Collaborative will maximize the use of the research resources on the Internet in ways that are deeply integrated into the curriculum and familiarize students with ways of using technology that are increasingly the key to satisfactory employment.

Once we have demonstrated the feasibility of this approach, any group of schools will be able to pool their resources and jointly create on the Internet educational resources no one school could offer alone. This could support the creation of smaller units within large schools and lead to the revitalization of small high schools. For all schools it would represent a resounding argument in support of the current educational investments in networking technologies.

OBJECTIVES

1. **Create a large, diverse collaborative of schools that will share resources.**
2. **Provide high-quality, network-based professional development for participating netcourse teachers.**
3. **Develop and offer a wide range of excellent, innovative netcourses that take full advantage of the Internet and serve a diverse group of students.**
4. **Create a collaboration model that is feasible for all schools, scalable, replicatable.**
5. **Evaluate the project and its potential for wide-scale adoption.**

THE LONG TERM SIGNIFICANCE

Excellent, credit-bearing high school courses on the Internet could become the most important educational application of networking. Well-designed netcourses can now be created by teachers and made available anywhere and anytime. This capacity will open a rich array of new content and educational approaches to all students beyond the wildest dreams of even the most specialized schools. Netcourses could help districts realize the advantages of small, intimate schools without giving up the specialization possible in a large school. The courses will make it feasible to offer excellent courses to adult, institutionalized, and home-based students.

It is important that responsible educators quickly begin to explore the potential of the virtual high school and create a high quality, carefully-studied implementation. This can be done by creating a model set of netcourses that provide outstanding education and showcase the best uses of the Internet. If we do not set a high standard, it is likely that we will soon see a proliferation of inferior virtual schools that could give the idea a bad reputation.

This five-year project will create a virtual high school that offers a rich array of outstanding network-based courses and seminars. The Virtual High School will be operated and controlled through a Collaborative of 50 high schools throughout the country for their students. The project will be assisted by universities, businesses, non-profits, and international schools that will contribute expertise, faculty, interns, and researchers.

The success of this project would have an impact far beyond the participating districts. Additional schools will want to join or create their own collaborative. To facilitate this, we will accept schools on a partially-funded associate basis and create regional groupings that could develop into independent collaboratives. To support this dissemination effort, we will engage a highly-experienced outside evaluation team to carefully document our progress. To help others, we will widely disseminate the evaluation results as well as project-generated curricula and technology.

MEETING THE OBJECTIVES

1. Create a large, diverse collaborative of schools that will share resources. The VHS Collaborative will start with 50 Charter member schools and will expand to a total of 130 during the project. This large scale makes it possible to float specialized and innovative courses because there will be both the faculty expertise and student demand. Each year, every school will contribute the equivalent teacher time and enroll a proportional number of students in network-based courses from the Collaborative.

2. Provide high-quality, intensive professional development for the participating teachers. The project will offer rigorous Professional Development Workshops on netcourse technology, techniques, and teaching practices. The workshop will be offered online and will be equivalent to a three-credit graduate course. All VHS teachers will be required to pass this course successfully before offering an online VHS netcourse. This will assure students and schools that all netcourses are taught by well-qualified teachers who are well-versed in the latest technologies, content, and teaching strategies.

3. Develop and offer a wide range of excellent, innovative netcourses that take full advantage of the Internet and serve a diverse group of students. The primary beneficiaries of this project will be over 9,000 students who will have access to an unprecedented range of academic opportunities. Participating teachers, working in teams with assistance from experts, will adapt existing high-quality, standards-based course material to the netcourse format. Courses will be developed for all students; the choice of courses to be developed will be informed by an annual needs assessment of all schools in the Consortium.

The project will take full advantage of evolving Internet resources and software. Students will use the Internet for collaborative research, access to experts in business and education, discussions with their virtual classmates, simulations, and publication of their work. Their use of technology will mirror its real-world. Internet technologies will be incorporated that provide ways to make the Internet a more expressive medium for students with different intellegences and learning styles, to simplify student tracking and evaluation, to handle registration and other administrative functions, and to provide adaptive aides to challenged students.

4. **Create a collaboration model that is feasible for all schools, scalable, replicatable.** The Collaborative is based on the proposition that each school enrolls students in netcourses in proportion to the amount they contribute in the form of teacher time. This model inherently supports growth at no cost and can be easily transplanted. Grant funds are needed to launch this process, evaluate its feasibility, and provide assistance to poorer schools; once begun and proven effective, the VHS Collaborative can continue and be replicated without outside funding. The model is feasible in low-income schools because it makes only modest hardware demands; schools can start with two computers with dialup modems. The project will support regional groupings of participating schools that can become independent projects and will accept Associate member schools that can help seed additional collaboratives.

5. Evaluate the project and its potential for wide-scale adoption. The project will be thoroughly evaluated by an experienced, external team internationally recognized for its expertise in the role of technology in educational reform. The evaluation is designed to provide clear, on-going documentation of success, highlight effective practice, and provide valuable lessons for others. The evaluation results, the Consortium idea, the technology, and the netcourses will be widely disseminated electronically, in print, and through professional presentations.

PROJECT DESCRIPTION

THE VHS CONSORTIUM

Consortium Members

The VHS Consortium consists of member schools assisted by business, non-profits, universities, and government agencies. The core of the Consortium is its 50 Charter member schools from every region of the country. The Charter members mirror the diversity of American education and include schools that are urban and rural, public and private, elite and struggling. To test the VHS Collaborative concept, it is important that there is full participation of schools serving low-income populations. For this reason, we have set aside grant funds for computers and connectivity to assist otherwise-qualified low-income schools and business partners have been identified to provide one-to-one matching funds and in-kind assistance to these schools.

The response to this proposal idea has been overwhelming, generating far more interest than the 50 schools we can sustain through this grant. For this reason, we have created an Associate status that will permit additional schools to participate without impacting the project funding request. We will start with 30 Associate schools and expand to 80. The Associate schools will represent a 'no cost' group that will permit us to scale up in the expansion phase of the project and seed the creation of new VHS consortia. Six non-U.S. schools are Associates, allowing U.S. schools to benefit from the participation of international schools without having grant funds subsidize non-U.S. students.

The Concord Consortium is a key member of the VHS Consortium, providing world-class professional development netcourse expertise, networking technology, and curriculum development experience. They are currently pioneering a range of innovative educational uses on the networking, particularly for teacher professional development.

The VHS Consortium includes a broad cross-section of business partners. 3-Com Corporation will be a national project sponsor, providing in excess of $5M of technology for schools in the Massachusetts and California regional groups and serving on the project Advisory Committee. Many additional companies are committed to supporting individual school involvement in the project with a particular emphasis on low-income schools. Universities, colleges, DoDEA, a regional education lab, and others will also make important contributions to the Consortium. Many have committed volunteer teachers who will participate in Consortium netcourses. For instance, General Electric's ElFun Society has agreed to contribute at least five engineers in this program.

The Regional Strategy

The project is national in scope with ten regional concentrations of member schools. Within each region, member schools will meet and plan joint activities. The regions are:

California: Six districts ranging from rural to urban, including members in 3-Com's school network.
Central States: A dispersed set of schools in the High Plains supported by McREL.
Massachusetts: Hudson and four other schools west of Boston in the Liberty Net.
New York City / New Jersey: A set of schools including a significant ethnic and urban population.
New Jersey / Pennsylvania: A diverse group of schools coordinated by Research for Better Schools and the Mid-Atlantic Eisenhower Consortium.
North Carolina: Six diverse schools organized by the N.C. Public School Forum.
Pittsburgh: A group of 12 schools from Greater Pittsburgh organized by a regional collaborative together with a CES school in Ithaca.
Washington: Four diverse schools in the Pacific Northwest supported by U. Washington.
International: Two Canadian schools, three New Zealand, one UK, and selected DoDEA schools.

The advantages of the regional structure are:

Frequent face-to-face meetings. Coordinators from member schools will be able to meet frequently to iron out details, share experiences, and advise the national office. Representatives of the national project will meet with these regional groups twice each year.

Growth potential. The regional structure will promote expansion to include additional Associate school members. There will quickly be adequate resources in each region to create separate virtual schools and these regional groups could easily seed their development.

Providing national representation. We want the national program to reflect school needs, but it would not be feasible for representatives of 50 schools to participate in policy formation at the national level. Instead, we will use a representative model where each region will elect a person to the national project Advisory Board that will set project policy.

As part of the grant development process, a number of very strong groupings have emerged that illustrate the importance of working at the regional level. For example, in North Carolina Gail Morse has organized a model six-school grouping assisted by the UNC Charlotte. The schools reflect the diversity of students in the state, and each school has corporate partners ready to provide volunteers and technology assistance of 3,000 days per year. The involvement of the university and business will give this group the ability to become independent. A different model is provided by the five Central Massachusetts school districts that make up the south Liberty Net funded by 3-Com Corporation. This group features dual enrollment programs at numerous area colleges and universities.

One very special group of schools are the Department of Defense schools (DoDEA) and other international schools. Because they are scattered over the world, the DoDEA schools have vast experience in distance learning and are now developing Web-based approaches to learning. Although they cannot accept Federal grant funds, they will be Associate members in order to contribute what they know and to learn from our approach. They and the other six international schools will add considerably to the diversity of our virtual student body resulting in a richer and more relevant educational experience for U.S. students.

School Selection Criteria

Member schools were selected for the VHS Consortium using the following criteria.

1) **Meet the minimum project requirements.** To be a member, a school must:
- Be accredited for grades 9-12.
- Be willing to contribute the minimum required teacher time (20% FTE).
- Be likely to have 15 students enrolled in netcourses for each teacher-section contributed.
- Have Internet connectivity and computers to support the participating teachers and students.
- Provide at least $50K non-Federal matching contribution over the life of the grant.
- Provide an on-site coordinator. The coordinator will be the administrative point of contact between the coalition members and will be responsible for on-site grant operations. The grant will compensate Charter member schools $10K/yr to offset these costs.
- Be committed to the project. The administration and teachers must fully support the VHS Consortium goals, objectives, and plan.

2) **Support diversity.** The students in U.S. VHS Charter member schools, taken as a whole, should reflect the diversity of American students in terms of ethnicity, income, and geography. Schools serving majority low-income populations were sought out and offered assistance if they were otherwise qualified.

3) **Share a compatible educational philosophy.** Each school should be committed to implementing Goals 2000 and share a vision of education that emphasizes quality, experiential learning, and the full

integration of appropriate technologies. This project should support, and be supported by, other school improvement activities with compatible goals.

4) Contribute to the Consortium. Special consideration was given to schools with experienced, world-class teachers who are able to make important and unique contributions to the project. We made a special effort to include schools that have been teaching over the network and those who have been using students for network operations. We also strongly encouraged regional groupings of schools.

VIRTUAL HIGH SCHOOL NETCOURSES

The key to the success of this project is the netcourse design and technology. Netcourses are unlike other approaches to "distance education" because they are based on extensive experience and solid educational theory. While many have been experimenting with online courses, they are feasible only now because of advances in networking technologies and our growing understanding of how best to use this technology. To paraphrase Seymour Papert, there have been many failed *teaching* technologies, but this is a *learning* technology and it will succeed because it is well-adapted to learning needs.

The VHS Netcourse Design

We base our netcourse design on the extensive literature of network-based instruction for adults, professional development, and advanced college courses, as well as the work on network support for group collaboration (see References.) This experience is summarized in Tinker & Haavind(1996). This experience indicates that the best designs for network courses have the following characteristics:

Asynchronous seminars. Student learning should rely heavily on collaboration based on multimedia messages to on-line group members, moderators, and teachers. The resulting collection of contributions creates a shared knowledge space students use to create their own understandings (Scardamalia & Bereiter, 1994). Since these experiences are not strictly synchronized, students can participate anytime during the school day, at home, or even during holiday travel (Harasim, et al, 1995).

Supported by media kits. The netcourse conversations are usually in response to activities, artifacts, events, or experiences that have been arranged for all members of the group by the netcourse designer. To support this, students will be sent a media kit designed for each course, consisting of a lab kit or print, software, video, CD, and related resources as appropriate.

Carefully scheduled. Courses that rely on asynchronous collaborative learning must be carefully scheduled so that all members of online groups are thinking about the same issues at about the same time.

Software intensive. Because network-based courses require computers, netcourses can integrate computers into all aspects of learning, including many off-network applications, such as data acquisition and analysis, desktop publication, modeling, simulations, and programming.

Supplemented by face-to-face meetings. Many observers believe that some sort of face-to-face meetings are an important part of online courses, particularly at the beginning and end of a collaboration. At the start it creates motivation and a sense of trust; at the end it provides public recognition and a forum to demonstrate new insights. Our project design permits regional meetings where virtual class members can meet as well as in-school study groups of students taking the same virtual courses.

This project will take advantage of the unique capacity of the network to support collaborative learning anywhere and anytime. The so-called synchronous technologies – audio and video conferencing and broadcasting, real-time chats, whiteboards, and shared applications – will not play a major role because they impose difficult scheduling constraints and the video-based approaches make unrealistic

demands on bandwidth. (Stored audio, such as RealAudio™, in contrast, is both asynchronous and compact and will play an essential part in netcourses, particularly in language courses.)

VHS courses will access the rich resources on the Internet, but not rely entirely on networking for interactions and learning. Most participating students will meet at school in local study groups and make use of print, videos, labs based on kits, and local projects. Rather than using the network for delivering course content, its primary use in the courses will be for research, collaboration, group interactions, information gathering, and publication. Because of this, the "feel" of the course will more closely resemble a seminar than a typical lecture-based course. The style of teaching and learning we will use is highly supportive of current educational reform strategies that move the teacher from lecturing to supporting student inquiry.

Science and technology laboratories are a major challenge to all forms of distance education. The usual solution, to eliminate or replace them with simulations, is not consistent with our commitment to excellence. The Concord Consortium has already developed kit-based labs for physics that are inexpensive but powerful and support student inquiry. This use of kits will be expanded to the other sciences and technology courses.

A number of teachers who have experimented with network-based instruction report that the writing burden on the instructor may be overwhelming (e.g. Romiszowski & de Haas, 1991). These teachers created a situation where each student's learning depends on messages the teacher composes and sends. The key to successful netcourse design is to avoid placing the teacher at the center of the conversation in this way. Our design avoids this trap by using a range of Internet research resources, computer applications, simulations and students media kits. The teacher's role is to plan the experiences, facilitate the online conversations, and evaluate student performance. These responsibilities should permit teachers to manage netcourses with enrollments of 25 or more, but we have conservatively planned on an average of only 15 students. One important outcome of this project will be better information about how many high school students can be successfully taught in this format.

Netcourse Technology

Technology designed to increase the value of online collaboration is improving at an unprecedented pace. Most of the literature on network-based courses is based on research done at least a year ago, before the Web could be used for courses. This is another reason to discount the importance of extremely small netcourse enrollments advocated in the literature. Current Web technologies will support larger courses and seminars because they vastly increase the expressiveness of electronic communications and simplify the creation of shared knowledge Where early Web functions provided limited interaction and had most information flowing from server to client, now applets and a range of new client and server functions have greatly increased the interactively and flexibility of networking. We can now utilize these Web technologies to increase student expression, simplify the review of past messages, scaffold thinking, promote synthesis, share data, and fully realize the power of hypermedia.

During the first year of the grant, the network will be used for Professional Development Workshops. The technology used will be based on the collection of on-line resources developed by the Concord Consortium for teacher professional development for their International Netcourse Teacher Enhancement Collaborative (INTEC). The technology used in that project has a number of important features

Multimedia messaging. The basic message used for email, conferences, and library resources is an HTML page. Using a convenient editor, students can make all their communications easily include formatted text, graphics, voice and other media. This will increase the range of resources utilized and learning styles encompassed.

Graphical annotation. The Concord Consortium will supply applets that permit any user to generate threaded, graphical or text overlays to any graphics. Pop-up data, hot links, and geo-referenced maps and data will be added to make this a powerful user graphics tool.

Integrated applications. INTEC supports a suite of applications for spreadsheets, data acquisition and display, shared databases, and image analysis that is an integral part of their technology, facilitating easy sharing of specialized files. The applications are either free or strongly discounted.

Publications and Portfolios. There will be public libraries where students can publish their work, private areas for personal notebooks, and semi-private portfolios used in evaluation.

User Control. INTEC technology will make it easy for users to create discussion groups, library resources, and shared databases. This reduces the functions required of a system operator and encourages participants to be more spontaneous.

Administrative databases. A group of server databases greatly simplify netcourse administration by supporting online student registration, password protection, course design, course scheduling, and teacher grade books.

These functions were designed for teacher professional development and will be used for that purpose during the first year VHS project. In the second year, we will add student netcourses and support them with a modification of that year's INTEC technology. As the grant unfolds, the technologies available to support both student and teacher netcourses will improve. Our partnership involves experts in educational networking who are helping advance the state of this art and are able to bring technological advances into the VHS quickly. The Concord Consortium will stay current in these advances and integrate them into the evolving package of Web technologies used in the project.

A set of software resources will be assembled to support multiperson gaming and simulations. With the assistance of Prof. Fred Goodman of the University of Michigan, a recognized expert in this area, the Concord Consortium will assemble technologies that support simulations in which students assume different roles and resolve differences through scheduled meetings, votes, and barter. The result will be a convenient format which can be used in a variety of courses on history, government, and current events.

Concord Consortium will also act as a repository for information on assistive technologies for challenged students and teachers enrolled in netcourses, such as modified keyboards, vocalizers, pointers, and specialized switches. They will provide assistance to schools for ways to overcome barriers to participation of students with disabilities and will advise member schools on adaptive aids we can provide to any student who needs technology to participate fully in our netcourses. To the extent feasible, we will use the $375K Equipment Matching Fund for this purpose, turning to our corporate partners for matching contributions.

A Sampler of VHS Netcourses

Beginning in the second year of operation we will offer a variety of netcourses for students, starting with approximately 15 different courses and building to 50 or more. The final size, titles, content, and target populations of VHS netcourses will be determined by the needs and recommendations of the Consortium members.

We have identified five classes of secondary courses that are difficult for schools to offer and are well suited to the netcourse format and technology: advanced courses, technical courses, core academic courses that can utilize network-based innovations, academic support for school-to-work programs, and courses adapted to the needs of language minority students. The course ideas sketched below in each of these areas give a taste of the potential of this approach. Imagine how exciting it will be for students in the fifth year of the project to select courses from 50 or more netcourses of this caliber.

Advanced Courses

The most obvious need that can be addressed with shared resources is the problem of providing specialized material for advanced students, particularly in mathematics, science, and languages. We want these courses to support curriculum change, the new standards, and the movement toward increased use of student inquiry in teaching. For these reasons, we will avoid offering the standard discipline-oriented courses or their Advanced Placement equivalents. Instead, we will draw from the rich array of new approaches and funded projects to offer interdisciplinary courses and ones that are well-adapted to the special requirements and opportunities inherent in netcourses and our seminar-like design. The following are examples of the advanced netcourses we are prepared to offer:

Future Studies. We will create a new course that invites students to study trends and make their best collective guesses about what the world will be like in 25, 50, and 100 years. They will make projections of populations, energy, food, technology, pollution, education, national economies, quality of life, and social conflict and then hold on-line model UNs to set policy that will avoid potential problems.

Hands on Physics. This course, developed by Dr. Tinker at the Concord Consortium with the participation of Hudson teachers, consists of extended projects each emphasizing a different areas of physics. In each, students explore a problem, build a project, and undertake their own investigation.

Modeling and Calculus. A non-formal approach to calculus that emphasizes creating dynamic models using spreadsheets and other software tools. Applications to science and economics are featured. This draws from experts in many institutions and material in the INTEC project.

Applied Math. COMAP has assembled an impressive group of applied mathematics units called ARISE that reinforce algebra and illustrate the ways algebra is used. With COMAP's assistance, a selection of these would be adapted to a netcourse.

We could also offer introductory, interdisciplinary courses based on fields such as psychology, economics, and engineering. It will also be feasible to offer dual-enrollment courses that give students both college and high school credit. This should be very attractive to colleges looking to expand their enrollments by making their best courses available over the network. Fitchberg State University has already agreed to offer college credit for selected VHS courses. Once funded, we will seek out additional colleges willing to credit or offer such courses either at no cost or a nominal enrollment fee.

Technical Courses

We would like to offer a series of courses that solve a vexing cost problem for schools while giving students highly marketable skills. The vexing problem is providing support for networked computers, a cost that many business budget at $1,200/yr per computer. This level of funding is beyond the resources of most schools, so either an alternative must be found or networked computers will not be used well.

The solution is to train students to provide network services such as creating and extending the network, installing and maintaining servers, installing and supporting server and client software and applications, training students and teachers in using the network, and locating on-line resources for teachers. In the Olympia (WA) Public Schools, students have been recruited and trained for this so that the entire, well-networked district has only one paid employee for all technical services. The result is huge savings and a well-trained cadre of students who can command impressive salaries.

There are other technical areas where students can acquire skills that permit them to undertake tasks for the school that save funds and expand the range of possible academic programs, such as computer construction from kits, the construction of laboratory apparatus and facilities, and the design and

construction of instrumentation. Each of these is being done in a few schools, but the required teaching expertise is not widely available. This problem can be overcome with netcourses.

There is, of course, a much broader range of technical netcourses we might offer, depending on school interests and the availability of kits. Each course will go well beyond the technical 'how-to' level to address underlying science and engineering principles. Technical netcourses we could offer include:

Network Installation. Wiring, connecting to the Internet and running servers.
Network Operations. Security, basic server functions, email, newsgroups, audio, video.
Computer Construction. Construction, debugging, bootstrapping, software installation, drivers.
Instrumentation Principles. Basic electronics, use of oscilloscopes, sensors, amplifiers, , opamp circuits noise and its avoidance, analog-digital converters.
Robotics and Control. Feedback, actuators, embedded controllers, development systems, projects.
Design Lab. A networked version of Woody Flowers' famous MIT design course,

Innovative Core Academic Courses

The VHS can be a powerful mechanism for disseminating and instituting highly innovative approaches to courses, particularly courses that utilize network resources. The INTEC project has identified many of the best, inquiry-based projects in secondary math and science, and has found that the staff in these projects are highly motivated to their materials since they view our work as a powerful way to disseminate their work. Similarly, educational publishers and software vendors with innovative products that are often difficult to market have proven to be quite cooperative. Again, the following are only examples of the innovative netcourses we are able to develop and offer:

Economics and the Real Budget Debate. Students will be invited to participate in the Federal budget debate, working with the current Administration budget proposal and play the parts of various Senators and Congress people, they will use a large-scale simulation to create their own budget. Along the way, students will learn about the many government programs, the pressures on Congress, and the economics of the Nation.

Writing Through Hypertext. There is a growing awareness that hypertext – linked pages that contain a variety of media, including text, graphics, sound, and software – represents a new kind of creative medium that may be particularly well-adapted to the way we learn, think, and express ourselves. We will offer an English netcourse on hypertext writing and criticism.

Integrated Science. The science standards call for integrated math and science courses that are very hard to staff. With NSF funding, the NSTA SSC project is working with selected high schools to create a rich array of interdisciplinary science units that are distributed online. With NSTA assistance, we will create two integrated science netcourses using a selection of the best units.

Global Lab. An ecology-oriented science course under development at TERC and directed by Drs. Tinker and Berenfeld. The course integrates biology, chemistry, and physics by having students select and study a field site. The course is developed for on-line collaboration and expects students to undertake their own extended investigations.

Project Lab. This netcourse will support extended student projects and investigations in any area of math or science. Students will be guided through a series of projects and will learn experimental technique, data analysis, the use of basic computer and instrumentation tools. Scientists and educators will be available online to help students select suitable projects, develop procedures, and build their own instrumentation.

School-to-Work

School-to-work programs that place students in local work environments are increasingly popular. Providing academic support for these placements is, however, a difficult problem in light of the wide variability of the work environments and the inexperience of many work supervisors in creating good educational activities. Networking can address this problem by placing all students with similar work environments in the same netcourse and providing expertise in the relevant academic area that can support students, teachers, and site supervisors.

For instance, any one school might have only a few school-to-work students in hospitals. Across the VHS Consortium, however, it is likely that there will be demand for a netcourse of hospital-based students developed by a faculty team experienced in biology, medicine, and analytical methods. This team can create in-school investigations and on-line discussions that will greatly enhance what students could learn from their hospital experiences. The VHS Consortium could develop ten or more specialized netcourses of this kind, adapted to creating academic support for different workplace environments. An innovative project directed by Margaret Vickers funded by the Pew Foundation has created excellent materials in three areas to support school-to-work programs in this way. Dr. Vickers and these materials will be available to the appropriate VHS netcourse teacher teams.

This concept is also applicable to community service learning programs. We will explore the potential for Internet-based CSL netcourses.

Courses for Language Minorities

A pressing problem in many schools is the need to provide quality secondary-level courses for students whose primary language is not English. It is not practical to offer a full range of secondary courses in all languages, but instruction exclusively in English places these students at a tremendous disadvantage. The compromise many schools are adopting is to provide assistance to language minority students to help make the transition to courses in English. Netcourses with the following characteristics can support students as they make this transition:

Non-verbal forms of communication. The netcourse format we use makes extensive use of hands-on activities, labs, graphics, and mathematics that transcend language.

Translations of key concepts. Glossaries, summaries, and lab instructions can be produced in a student's primary language. Students can help add to these through on line contributions.

Primary language discussions. Networked discussions can be organized in students' primary languages, or in a mixture of that and English.

Again, by aggregating demand across the VHS Collaborative, we can support thin-market needs that individual schools cannot. We can develop and offer core secondary courses in English with support for language minority students in several languages, as the demand arises.

TEACHER PREPARATION AND NETCOURSE DEVELOPMENT

Each member school will contribute teacher time to the Consortium. Teacher recruitment will be coordinated by the Project Director so that the best talent available is matched with the needs of the member schools. The resulting group of teachers will be augmented by volunteers from business, other volunteers, preservice interns, college faculty, and project-supported teachers. To ensure netcourse quality, all these potential netcourse teachers will need to successfully complete a graduate-level Professional Development Workshop (PDW) netcourse developed by the Concord Consortium for the project. This netcourse for teachers will address the technology and techniques of offering netcourses for students as well as the adaptation of courses to the netcourse format. The resulting professional development will make a valuable contribution to schools in the VHS Consortium by disseminating

high-quality educational and technical information in a timely and convenient manner. In addition, it provides an opportunity to develop new netcourses.

The Teacher Pool

Over the term of the project, we will supplement the number of teachers available to the VHS with volunteers a number of sources. Expanding the teacher pool has a number of wonderful side-effects. It brings new kinds of teachers into pool and expands the breadth of experiences to which students are exposed. Business people, scientists, engineers, Senators, retirees, and others will make the netcourses richer experiences.

The VHS will be an attractive place for preservice students to intern and these interns can be an important way to enlarge the teaching pool. The PDW netcourse can be accredited as part of a student's graduate program, and the virtual internship will be both convenient and excellent preparation for high-tech teaching positions.

The teaching pool will be augmented each year by five grant supported teachers who bring special skills, knowledge, and curricula expertise to the project. If, for instance, there is a call for a netcourse on a particular topic, but no school contributes a teacher qualified to teach it, we will use project funds to hire such a teacher. We need this flexibility as the project gets underway to ensure that we can meet the needs of the member schools with the teachers available in the pool.

Using all these strategies to increase the size of the teacher pool, we will be able to offer about 15 student enrollments per teacher section contributed. If, as we suspect, we are able to maintain quality for netcourses of 20 or even 25 students, then the balance will change and schools will actually **increase** the number of student they can serve each time they contribute a section to the VHS.

The Professional Development Workshop Netcourse

The Professional Development Workshop netcourse is designed to ensure that teachers understand this new medium and adapt their teaching strategies to take full advantage of its features. It will also provide an opportunity for teachers to learn the content of a specific netcourse by contributing to its development. This is not only a good learning strategy, it provides an effective way to utilize teacher talent to create new netcourses that would be prohibitively expensive to develop in any other way.

Patterned after the highly-respected INTEC model, the PDW netcourse will require approximately five hours per week throughout one academic year and will consist of the following parts:

Part I: Netcourse Technology. What a netcourse looks like to students. Using supported tools for graphics, HTML messages, graphing, data analysis, annotation, databases, etc. What it looks like to teachers--using grade books, assignments, portfolios. Creating system resources such as databases, discussion groups, and libraries. Netcourse resources: gaming, simulations, whiteboards, real audio, video. (7 weeks.)

Part II: Offering Netcourses. The constructivist educational theory as applied to netcourses. Collaborative learning on the net. How to create a seminar-like atmosphere online. Research resources on the Internet. The importance of weekly assignments, good discussions, and the moderator role. Alternative forms of student assessment on the net. (7 weeks.)

Part III: Developing Netcourses. Working with online experts in groups of 2-10 teachers, participants will create an online version of a conventional course, generate a new netcourse, or improve an existing netcourse. Course development technologies and methods will be addressed. Strategies for overcoming barriers to the participation of challenged students will be incorporated. Participants will generate a complete online course including description,

goals, media kit description, weekly assignments, and assessment criteria and procedures. (14 weeks.)

In order to inject the best available curriculum thinking into the netcourse development process, we will provide extensive support for curriculum experts to be available online. These will address general issues such as standards, student evaluation, assistive technology, the use of inquiry as a teaching strategy, new roles for teachers, and curriculum development strategies. Experts in particular curricula and instructional strategies will also be available. For instance, the developer of a software Federal budget simulation will be available to the teacher group developing the related netcourse.

An average of ten teachers will contribute to and offer each course. We expect some highly gifted teachers will develop and offer their own netcourses while others will contribute to large development teams. Some netcourses will go through several generations of development in successive years. If we have underestimated the ability and desire of teachers to develop netcourses, we will have an even-larger set of netcourses to offer member schools at no additional cost to the project.

Each year, the VHS project staff will conduct online a netcourse needs assessment of all member schools. New netcourse ideas will be tried out and data collected on the kinds of courses most needed. At the same time, member schools will be asked to nominate 2-3 teachers who might offer future netcourses. Staff will match the needs against the skills of the potential teachers and teachers already taking the PDW netcourse. Schools will be told which teachers are most needed and the next group will be selected. Imbalances between available teachers and needed netcourses will be corrected through volunteer recruitment and grant-supported teachers.

Ensuring Quality

It is understood that the entire netcourse selection and design effort as well as the teacher recruitment process will be conducted with the goal of creating the best possible netcourses, focused on high academic standards and addressing the new standards and frameworks. It is absolutely essential that we build trust in the project and the technology it fosters by consistently delivering quality instruction.

The primary quality assurance strategy will be to ensure that the PDW netcourse meets world-class graduate-level standards and eventually carries graduate credit. We will actively seek graduate credit for the netcourses. Several universities have expressed interest, but none worth considering can grant prior approval that could be included with this proposal without seeing the course in operation and the resulting teacher work. In lieu of formal credit, the netcourse content, evaluation criteria, and participant work will be submitted to an Academic Advisory committee of outstanding university faculty that will judge whether the course meets the requirements typical of their universities. This will help use maintain the highest quality and speed formal accreditation by one or more of these universities.

The following faculty have agreed to serve on the Academic Advisory committee:

Gerald Abegg	Boston University
Bonnie Brunkhorst	California State University, San Bernadino
Louis Gomez	Northwestern University
Jane Butler Kahle	Miami University of Ohio
Jim Kaput	The University of Massachusetts, Dartmouth
Jim Levin	The University of Illinois
Paul Resta	University of Texas

All of these serve on a similar INTEC committee and so will be familiar with netcourse design. Additional members with expertise in the arts and humanities will be added to the committee. In addition to reviewing our netcourse offerings, several of these advisors have offered to seek PDW

accreditation at their institutions. We also anticipate recruiting preservice teaching interns from these universities.

Through involving these leaders, we expect that, by the third year of the grant, several universities will offer credit for the PDW netcourse. Some will offer blanket credit, others may want to review participant work. There will be a charge for graduate credit, and these costs will vary. It will be up to the individual teacher to pursue these options and pay the fees directly to the granting university.

Because we plan to offer graduate credit, we will institute a grading system using alternative assessment techniques based on portfolios, journals, contributions to the virtual groups, and self-reflection. The PDW staff team will assign the grades with input from moderators on the basis of clearly-communicated grading criteria. The quality of the student netcourses developed in the second half of the PDW netcourse will be the most important criterion. As part of the grading process, staff and members of the Academic Advisory Committee will review these designs, providing another netcourse quality control mechanism. Completion of the PDW netcourse with a grade of B or better will be a prerequisite for offering a student netcourse.

IN-SCHOOL ORGANIZATION

Project Coordinator

The grant will fund a 20%-time project coordinator in each of the 50 Charter member schools. This person will be responsible for:

Recruiting teachers for the project teaching pool.
Recruiting and scheduling participating students.
Arranging access and support for the required technology.
Determining and administering the school policy for monitoring and assessing students.
Communications with the regional representative and the national office.
Meeting with other project coordinators to determine regional and national project policy.
Arranging and accounting for in-kind contributions to the project.
Disseminating locally information about the project and its corporate partners.

Facilities and Credit

Each school will need moderate computer and networking capacity; the grant can provide these resources only for a limited number of low-income schools. The minimal commitment will result in one teacher spending 20% time offering a netcourse and 15 students enrolled in a variety of courses. The teacher will need access to a networked computer one to two periods per day. The students will spend about half of one period per day with a networked computer in groups of two or three. The computers must all run Netscape 2.0 and have Internet connection either directly or through a dedicated dialup modem operating at 28.8 kb.

Most participating schools will want to schedule students taking VHS courses into rooms where their activities can be monitored and where help can be provided. A school could schedule all participating students into one room one period each day. This schedule simplifies staffing, since monitors need to be scheduled for only one period. The monitor could be the local project coordinator, the teacher serving in the faculty pool, volunteers, or other staff. For this schedule to work, the room used would need at least four computers and additional space with chairs and tables with our without computers for half the class. Students would need to talk among themselves, so the room should be large enough so that these conversations are not disruptive.

This schedule demands more space and technology than other approaches. Open campus high schools or schools that can use a suitable library space can have far more flexible student scheduling that

require fewer computers. If student computer access times were spread out over the day, one or two networked computers would be adequate for each group of 15 students.

The project opens the possiblity of reaching students and parents at home who have computer access. As this becomes more common in all communities or schools provide home computers, the VHS will be ideally-positioned to provide netcourse resources into homes and to involve parents.

All project netcourses will include assessments of student performance. These assessments will, wherever feasible, be standards-based and utilize improved, non-traditional modes of assessment. The results of student assessment will be made available to the project coordinators in each school. The way these assessments are used will be determined by each member school. Some schools will ignore the project assessments and conduct their own. Others will simply use the project assessments. We expect that many rely on a mix of project and local assessment.

PROJECT EVALUATION

There are three goals for the evaluation component of the VHS project:

- **Establish benchmarks**—appropriate to the goals, structure, and resources of the project—for measuring its impact on schools, teachers, and students.
- **Monitor the progress** of the project toward accomplishing its goals and provide information to project staff in a way that will increase the prospects for success.
- **Assess the impact** of the project and the lessons learned and document these in a way that is useful to other communities in their efforts to reform education.

Establishing Benchmarks

The goal of the VHS project is to provide a series of high quality, innovative netcourses that solve the course diversity problems for participating schools and contribute to school reform. The evaluation team will focus on the impact of the project on participating schools, teachers, and students. Consequently, during the first year of the project the team will develop benchmark measures in each of these areas to monitor progress and assess the project's impact:

Schools: number and demographic distribution of participating schools, amount and kind of technology resources and equity of access, continued school participation, participation of new schools, the quality of courses, the contribution of these courses to curricular completeness and diversity, administrator and community attitudes toward the project, indications of project contributions to school reform, institutional cost-benefit analyses, and evidence of scalability.

Teachers: number and demographic distribution of participating teachers, teacher background, continued teacher participation, participation of new teachers, indicators of impact of professional development activities, measures of pedagogical approaches and teacher behaviors, range of uses of technology, and teacher attitudes toward the project.

Students: number and demographic distribution of participating students, percentage of student course completions, measures of student study behaviors, student attitudes toward the project, assessment of student learning as measured by project assessments, quality of student products, and/or norm-reference scores. Since project assessment materials will be developed by participating teachers, the evaluation team will work with teachers as part of their professional development course to develop standards-based and performance-based assessment instruments for their courses.

In addition to the benchmarks above, the evaluation team will collect qualitative data that describes the personal decisions, social processes, and lessons learned as a result of school participation. We will

describe how schools, teachers, and students decided to participate in the project. We will describe what it is like to develop and teach network-based courses. And we will describe how these courses effect the way students interact, study, and learn. We will be particularly sensitive to special issues and potential problems, such as student or teacher feelings of isolation or disengagement, grade comparability, course comparability, course accreditation and acceptance for graduation and college admission (e.g., course quality, contact time and credit hours), teacher accreditation across state lines and acceptance of courses, student supervision, and record keeping and scheduling.

Monitoring Progress

An important function of the evaluation is to provide VHS project staff with information on the progress of the project that will help assure the project's success. This formative feedback is particularly important in the early years of the project as project policies and practices are taking shape. Consequently, evaluators will spend time during the first year becoming immersed in project goals, strategies, and issues. Evaluation staff will attend early project planning sessions and interview project staff. They will monitor on-line professional development activities and attend regional teacher meetings. They will provide project staff with periodic reports (semi-annual during the first two years and annual during subsequent years) that describes progress toward goals and offers recommendations for improvements.

Documenting Impact

A major goal of the evaluation is to document the impact of the project for use by other communities. Two approaches will be used: semi-annual surveys and longitudinal case studies.

Surveys. Twice each year the evaluation team will survey all project coordinators, principals, and net teachers, and a sample of students. To the extent possible, these surveys will be conducted using Internet forms. The benchmark measures will be used to determine the impact that the project has on school organization and curriculum, teaching practices, and student learning. From project coordinators, we will collect data on course offerings and enrollments, completions and grades, technology resources, scheduling, and physical arrangements and student monitoring. From principals, we will collect information on reasons for participating, attitudes toward project, impact on curriculum and enrollments, and impact on school reform. From teachers, we will get data on their reasons for participating, their developing skills in pedagogy and content, the distant teaching experience, and reasons for any discontinuation. And finally, from a sample of students, we will get information on their reasons for participating; their attitudes toward the project, the courses, and their distant learning experiences; reasons for any discontinuation; and their evaluation of course quality.

Case studies. The evaluation team will involve five institutions, distributed across regions and types of schools (e.g., urban, rural; SES, etc.), in a series of longitudinal case studies beginning with year two and running through the end of the project. Each site will be visited twice each year (a brief mid-year visit and an end-of-year in-depth assessment) by members of the evaluation team who will interview and (when appropriate and feasible) observe participants. At each institution, we study participating teachers and their net-courses, the students in the target schools who are taking courses offered by other participating schools, and students elsewhere who are taking the target schools' net-courses. We will interview project coordinators, principals and other senior administrators, participating teachers, a sample of students taking courses, and a sample of parents or school board members. When feasible, we will contact college professors and employers to examine the long-term effects of the project.

Our intent with these case studies is to provide a detailed account of the process of participant involvement and the impact that the project has on school organization and reform, on teacher practice, and on student learning. We will document the changes that schools go through as they participate in a network-based curriculum program. We will study how teachers develop, prepare for, deliver, and

participate in network-based courses. And we will look at student processes as they study for network-based courses and interact with teachers and other students, and we will examine the student products that result from these processes.

In some cases, netcourses will be similar to courses that teachers normally offer. These cases provide us with natural experiments in which we can compare teaching and learning in network-based and classroom-based courses. In other cases, the courses will be unique. We will document this uniqueness and why the courses might not be possible without the network.

In years 2-5, we will issue an annual report that documents the impact of the VHS project and describes the lessons learned. These will be made widely available to other communities by using technology-rich ways of producing and distributing the report.

PROJECT MANAGEMENT

COORDINATION AND REPRESENTATION

We will rely heavily on the regional structure to help coordinate the project. In addition to the in-school coordinators, we will fund ten regional representatives at 20% time to organize regional meetings and visit member schools in their region. The regional meetings will provide an opportunity for teachers and students to meet and help formulate project policy. The school representatives from each region will elect their regional representative annually. The representative will be a member of the national project Advisory Committee that will meet annually for two days. The Advisory Committee will review all project activities, the project evaluation, and recommend project policy. Paralleling this set of meetings will be a set of online forums where project news will be posted and participating teachers and students can contribute to policy discussions.

SCHEDULE AND TASKS

During the first year the project will be launched and a group of teachers will be prepared to offer the first student netcourses in the second year. This will involve setting up the project structure, performing a first needs assessment, recruiting the first group of approximately 100 teachers, designing and offering the first PDW netcourse, identifying the netcourses to be offered students in the following year, and developing those netcourses with the PDW teachers and outside experts[1]. For this year only, the PDW netcourse will begin in the second semester and stretch into the summer. At the same time, the project will identify the roughly 50 new teachers needed in the second year who will begin the PDW workshop at the beginning of year two. Evaluation will begin by establishing benchmarks and providing operational feedback.

During the second and third years, the project will prove the concept by offering two rounds of student netcourses to over 3,000 students using approximately 200 teachers. Each year will involve launching a two-year cycle of needs assessment, teacher recruitment, teacher preparation, netcourse development and refinement, student recruitment, and student netcourse delivery. Evaluation of the entire process will be ongoing.

Years four and five will involve expansion and dissemination. The number of member schools will grow to 130, multiple teachers will be recruited from each school. Over 300 teachers will reach over 6,000 students. In addition, we will encourage the regional groups to expand and become independent.

HUDSON PUBLIC SCHOOLS ROLES AND CAPACITY

Sheldon Berman, Superintendent of the Hudson Public Schools, will be the co-Principal investigator of the project, devoting 15% of his time to project management and oversight, and serving as Chairman of the Advisory Board. Joy Buhler, Assistant Superintendent and Director of Finance, will devote 10% time to coordinate the Hudson effort. A 100% time Project Coordinator will serve as liaison between the members of the Collaborative and HPS, with the assistance of a 50% administrative assistant. HPS responsibilities will include identifying and communicating with the school and regional representatives, organizing the annual meetings of the regional representatives and the Academic Advisory Committee, administering regular needs assessments, working with representatives to recruit faculty, and administering the matching funds for adaptive aids and technology for low-income

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[1] The details of numbers of students and teachers served each year can be found in the spreadsheet model in Appendix III that is used as the basis of the budget.

schools. Contract and financial administration, bookkeeping, and auditing will be provided by Hudson for the project from indirect funds.

Hudson High School includes 717 students in grades 8-12 and draws from a multi-cultural and socio-economically diverse community. The school provides both a transitional bilingual education program and a multicultural curriculum. Under Dr. Berman's leadership, Hudson has aggressively pursued and provided leadership for many educational reforms. In the past two years, Hudson has initiated ten major reform projects. For instance, more than 20% of seniors are involved in dual-enrollment programs. One of our major reform emphases has been on the utilization of technology for instructional purposes. Our commitment to the Virtual High School is a consistent extension of all that we have accomplished and this commitment effort extends throughout our community. Both the School Committee and our Town Executive have committed to supporting the project and to assuming fiscal responsibility and accountability. Our district regularly manages multiple grants from private, state, and federal sources. Although the grant will require additional staff to manage reporting and accounting requirement, our accounting system will meet all the requirements of such a grant.

THE CONCORD CONSORTIUM ROLES AND CAPACITY

Robert Tinker, president of the Concord Consortium will serve as co-Principal Investigator the project, devoting 10% of his time. Under his direction, the Concord Consortium will provide the project network technology and servers, design and deliver the PDW netcourse, and assist in the design and development of student netcourses. Bruce Droste will serve as 100% Project Director , in charge of all aspects of course definition, professional development, enrollment, student and teacher assessment, reporting, and evaluation oversight.

Stephen Bannasch will coordinate the technology services, software, and development at 25% time assisted by two technical staff members. George Collison will design and deliver the PDW netcourse at 50% time. Carolyn Staudt will be available 50% time to assist in the development of student netcourses. Ray Rose will be available 20% time for consultation on teacher development and student access technology. There will be 100% administrative assistant to coordinate these services.

The non-profit Concord Consortium is ideal for this technical and educational support role. The Consortium is independent, but closely linked to Hudson, because Dr. Berman serves as unpaid Treasurer on the Concord Consortium board. CC currently has over $5M in grants, primarily from the NSF, for educational research and development on innovative applications of networking to education. The INTEC project funded at almost $3M by the NSF will offer network-based professional development in inquiry-based secondary mathematics and science teaching for almost 1,000 teachers throughout the U.S. using Internet Web technology. This technology is available to the VHS project.

Dr. Tinker is internationally recognized for developing innovative uses of technologies, particularly through his prior work at TERC where he created the idea of Microcomputer-Based Labs, the NGS Kids Network and a number of other network-based projects. Stephen Bannasch provided technical support for all these projects.

SRI INTERNATIONAL ROLES AND CAPACITY

The evaluation will be conducted by the Center for Technology in Learning at SRI International. The evaluation team will be led by Dr. Robert Kozma with the active participation of Dr. Edys Quellmalz and Dr. Andrew Zucker. Dr. Barbara Means will serve as a consultant to the team. Dr. Kozma is the director of the Center for Technology in Learning with a specialization in evaluating the impact of educational technology. Dr. Quellmalz is a senior scientist with a specialization in program evaluation and student assessment. Dr. Zucker is a program manager with a specialization in evaluation of school reform programs. Dr. Means is a vice president specializing in technology and school reform.

SRI International has an outstanding record of evaluating technology-related school reform projects and programs. The team members have been involved in a range of related projects that include developing a framework and guidelines for assessing the impact of the NII on education (NSF NIE), working with local school systems to develop plans that will increase the impact of high bandwidth networks on education (NSF NIE), evaluating the San Mateo County Education Challenge Grant (Department of Education), studying the impact of technology on school reform (Department of Education OERI), the evaluation of the GLOBE Project (NSF), and evaluation of both the NSF State Systemic Initiative (NSF) and the Eisenhower (Department of Education) programs.

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