

Virtual High School  
Case Report from the  
U.S.A. Exemplary Technology-Supported Schooling Case Studies Project

***Virtual High School: Classrooms Without Walls***

Ronald E. Anderson & Sara Dexter  
Project Co-Directors  
University of Minnesota

This report is a  
**DRAFT** March 2003

For further information on the *U.S.A. Exemplary Technology-Supported Schooling Case Studies Project*, including additional case reports and papers with cross-case analysis, go to <http://www.education.umn.edu/edutech/exemplary>

U.S.A. Exemplary Technology-Supported Schooling Case Studies Project Team Members:*University of Minnesota*



Ronald E. Anderson  
Sara Dexter  
Bobby Jeanpierre  
Karen Seashore

*SRI International*

Carlos Espinoza  
Robert Kozma  
Christine Korbak  
Raymond McGhee

The team wants to extend its thanks to the staff Virtual High School for allowing us to visit and for providing numerous hours of their time responding to our many questions.

The U.S.A. Exemplary Technology-Supported Schooling Case Studies Project was a part of international studies sponsored by IEA and OECD.

<p>International Association for the Evaluation of Educational Achievement</p>  <p>IEA's <i>Second International study of Technology in Education</i> (SITES) consists of three modules. SITES Module 2 (M2) is an international qualitative study of innovative pedagogical practices that use information and communication technology (ICT).</p> <p>The final project report and cases from participating countries can be found at <a href="http://www.sitesm2.org/">http://www.sitesm2.org/</a></p>	<p>Organisation For Economic Co-Operation and Development</p>  <p>The OECD case studies project, <i>ICT and the Quality of Learning</i>, is a major international initiative organised by the Center for Educational Research and Innovation (<a href="#">CERI</a>) within its work on Schooling for Tomorrow. This initiative is concerned with the profound implications that ICT has for education and learning and involves many of the 30 OECD member countries.</p> <p>The final project report and cases from participating countries can be accessed at <a href="http://iol3.uibk.ac.at/ICTandSchooling/caseStudies/">http://iol3.uibk.ac.at/ICTandSchooling/caseStudies/</a></p>
--	---

The contents of this report were developed under a grant from the Department of Education. However, the contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.

# Virtual High School: Classrooms Without Walls <sup>1</sup>

## Case Overview

The Virtual High School (VHS) was a non-profit consortium of high schools formed to develop a low cost way for high schools to offer courses that would otherwise not be available to their students. The innovation in VHS was the use of the Internet to deliver instruction across long distances and various time zones. The consortium developed Internet-based courses, or “NetCourses” as VHS called them, that were taught by consortium teachers for students in the consortium’s schools. During the 2000-01 school year over 3000 students from nearly 200 schools from 34 states and 8 foreign countries took part in just over 150 NetCourses. In addition to the academic courses, the Virtual High School web space featured a student showcase, student and faculty lounges, and a yearbook and school newspaper.

VHS teachers posted course materials on an Internet server, which students could access at any time; the online space also provided a conferencing system that allowed students and teachers to exchange asynchronous communications from any networked computer. Each participating school provided its VHS students with access to a school computer connected to the Internet. Using any Web browser software, students used a password to log into the VHS course in which they were enrolled. Through the browser the students were able to view, print, and respond to materials already “posted” on the course’s Web site by the teacher or other students, or follow links to any other pertinent Internet sites.

Each school in the consortium could enroll up to 20 students in VHS’s NetCourse offerings for each section of a teacher’s time (i.e., one NetCourse) that it contributed to the pool. Contributing teachers taught an VHS course in place of a regular course section at their home school. To prepare them to design a NetCourse, VHS teachers were required to successfully complete the Teachers Learning Conference (TLC), a 12 credit graduate-level NetCourse on the design and development of network-based classes; they also were able to consult with VHS staff members who had expertise in educational strategies and technologies appropriate for online instruction.

Funding for the Virtual High School came primarily from a 5-year Technology Innovation Challenge Grant awarded to Handley Public Schools in October 1996 by the U.S. Department of Education. A nonprofit educational research and development organization was also a full partner in the design and implementation of the VHS project. During the life of this grant original founding consortium schools were expected to contribute matching funds and there was some corporate sponsorship as well.

---

<sup>1</sup> This report is based, in part, on previous research done annually by a team of SRI International researchers from 1997 through 2000 as well as an analysis of selected course archives.

## Implementation Context

### *History of the Innovation*

Within the emerging federal effort to support the use of information technology for the improvement of U.S. education, the Technology Innovation Challenge Grant Program was established in 1995. Among the recipients in the second round of funding of this program, in the fall of 1996, was the Virtual High School (VHS) project. The grant proposal identified one overarching goal for the VHS consortium:

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 can be done in a way that is scalable and can continue post-funding, while spawning independent, parallel efforts.

In addition, the consortium was concerned with first establishing a model for online delivery of high quality offerings to high school students that could be shared with others. The founders sought to demonstrate how Internet-based courses could be of high quality and how this medium could add value to the teaching and learning process.

Equity of educational offerings was also of primary concern to the consortium members. From the beginning, the course offerings were designed to extend what was available to students in the participating schools, not to replicate them. Course offerings could be characterized as enrichment opportunities or advanced courses not typically available in smaller schools. Example titles from the first year include "Poetics and Poetry for Publication", "Introduction to Microbiology", "AP Statistics" and "Current Issues in Nutrition and Health."

The first year of the VHS project was spent getting ready for students to participate in NetCourses at the beginning of the 1997-98 school year. This was a big job, requiring the recruitment of schools, the training of teachers, the design of NetCourses, a commitment to particular types of technologies and course delivery systems (e.g., LearningSpace), accommodation to extraordinarily varied school schedules across 10 states, the development of uniform rules and procedures, publication of several course catalogs, the management of course selections and the enrollment of hundreds of students in NetCourses, and many other tasks.

VHS staff found that many high schools were interested in participating in the project. According to the principals and district superintendents, the two most attractive features of VHS were the capability that it offered them to quickly expand course offerings beyond what was feasible for individual schools and the appeal of using computer and network technologies in a way that seemed to offer important benefits to their students and teachers. In addition, a number of principals and superintendents discovered that VHS was extremely appealing to their school boards, which made it relatively easy to get any necessary board approvals, including (in some cases) additional funds for technology expenditures.

After a full start-up year for VHS, classes for students were offered during the 1997-98 school year. During that first year 29 Internet-based, credit-bearing courses were provided to about 500 students in 27 schools located in 10 states. By the 2000-01 school year VHS had grown dramatically. In that school year over 3000 students from nearly 200 schools from 34 states and 8 foreign countries took part in just over 150 NetCourses.

To help achieve their goal of sustainability after the initial funding from the five-year grant, the consortium implemented a fee structure. The consortium charges tuition for professional development and an annual membership fee to all participating schools. In order to provide for central administration, registration, server management, and all the other operational aspects of VHS, each school offering a NetCourse pays a \$6000 fee per year. Additional courses that are sponsored by the school are \$4000 per year. By teaching a course, a school can allow up to 20 students to take an VHS NetCourse each semester. Student-only schools are charged \$8000, in return for 20 student seats per year (10 per semester). In addition, schools joining the VHS consortium paid for the required professional development (\$3500 for training their teacher and \$1500 for training their site coordinator).

### ***School Culture, Professional Community***

Virtual High School was not only virtual in that all of its courses were offered entirely on the Web, it was also virtual structurally. There was no one school building that was Virtual High. Instead, the faculty, the student body, and the administration were distributed around the world and the classrooms were all online spaces. Thus, it was quite unlike most school sites where a culture and a professional community develops over time based primarily on face to face interactions among staff members.

There was an VHS administration who worked together to recruit participating schools, supervise the faculty, organize the course offerings, and maintain the software. They were located at Handley School District and a nonprofit educational research and development organization, both of which served as the key organizers for VHS. This administration took the responsibility to set policies and procedures for VHS, which were in place when the offerings began. They also ran the professional development offerings required of staff at VHS schools. Yet, with the exception of the two courses offered by Handley school district teachers, all the teachers were located elsewhere.

The faculty was composed of teachers employed by participating school systems all across the country. As part of their participation in a required professional development course, teachers did interact on-line with VHS staff and each other about pedagogical reform and issues related to the design and offering of NetCourse. But with the exception of occasional regional meetings, the VHS teachers did not meet face-to-face with one another. An VHS teacher's participation in the consortium was focused primarily on his or her own course and the VHS students enrolled in it; and those students were almost always located in different schools than the teacher's. Thus the interactions for staff members were nearly totally online and for the most part were with students, as opposed to colleagues. An exception was that there was one other adult, called a site coordinator, at every participating school.

Each school offering a course was required to provide a site coordinator. During the period of the grant, which ended fall 2001, schools received funds from the VHS grant to release 20% of a teacher or administrator's time to fulfill this role. The site coordinator focused on management and oversight, not teaching an VHS course; thus, only in very rare cases was the site coordinator also an VHS teacher. Their duties were to help the students at their site with any concerns about NetCourses in which they were enrolled, which might include a dozen or more different VHS courses. They also helped by promoting the VHS offerings to students and recruiting enrollees. Because students were the primary focus of attention for the VHS site coordinator, and not often were they enrolled in the coordinator's colleague's own

courses, it meant there was little time for or common area of concern over which a site's coordinator and its VHS teacher(s) would interact.

To foster interaction among peers, the VHS website created a common space they called the Faculty Lounge. It was only accessible to VHS faculty and staff. It served as a place to disseminate announcements and for peer-to-peer interactions, as described at VHS's website link leading to it:

This is the central meeting place for all VHS faculty and staff. Take a break and discuss everything from teaching experiences to favorite vacation spots with your VHS friends and colleagues at the Water Cooler [a faculty-only discussion area]. Share photos of your pets and kids! Or read updated announcements and FAQs (including technical FAQs) created especially for faculty.

In addition, current teachers were sometimes asked to interact with new teachers joining VHS as they participated in the required teacher professional development course. By forming a discussion group to share ideas and experiences, they could serve both an educative function and build a sense of professional community.

### ***Technology, Technology Support Structure***

Each participating school provided its VHS students with access to the Internet on computers located in the school. Using any Web browser software (such as Netscape or Internet Explorer), students used a password to log into the particular VHS course in which they were enrolled. From the browser the students were able to view, print, and respond to materials on the course's Web site by the teacher or by other students.

Although students used a common browser to access VHS courses, the courses were developed and electronically delivered through a proprietary technology called LearningSpace. LearningSpace consists of five interactive databases and tools for teachers to create and deliver on-line courses (Schedule, Profiles, Media Center, CourseRoom, and an Assessment area). This software was distributed by Lotus, a partner in the grant proposal. The LearningSpace software was housed on each teacher's computer and on the Internet servers maintained by the nonprofit educational research and development core partner organization. It provided a standardized environment in which the on-line course materials, schedules, assignments, discussions, and other documents were organized and viewed.

Figure 1, below, shows a view of the welcome page from a NetCourse called Biotechnology: The changing face of genetics. In it, you can see a link to four of the LearningSpace databases. The Schedule icon linked to the display of the dates for and descriptions of topics, assignments, and tests. The Profiles icon led to an area where brief biographical descriptions, and sometimes photos, of teachers and students were posted. The Media Center link led to readings and other digital resources associated with topics and assignments. The link to the CourseRoom module provided a space for threaded conversations about teacher- and student-supplied topics. This module only supported asynchronous discussion. There was no provision in VHS courses for synchronous activities, such as in Internet-based "chat rooms." This was also the module where all student work was stored. Within each of these modules navigation icons were used to adjust the amount of information viewed at a time, and to move through screens of information.

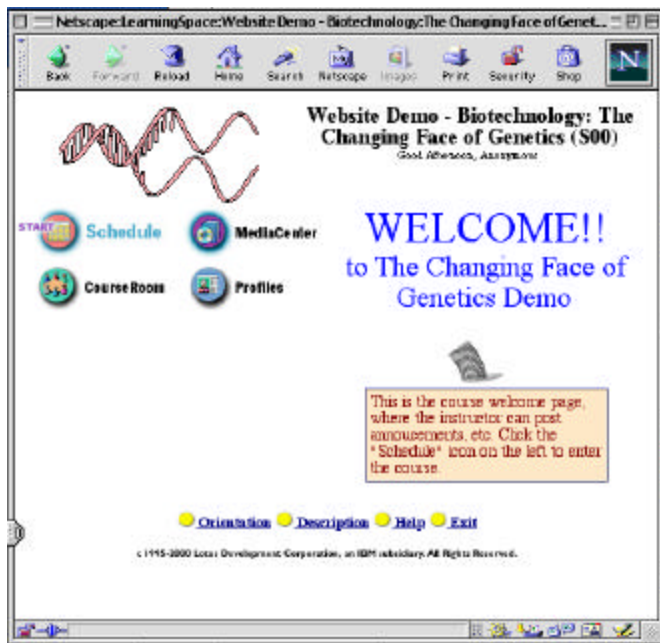


Figure 1. A sample view from LearningSpace.

Before being selected for participation, each school had to identify the title of a course that it would propose to offer and the name of a teacher who would teach the course. Each teacher was responsible for the design of his or her NetCourse using LearningSpace. Instructional support for this was available from one full-time instructional Designer/NetCourse Monitor, an VHS central staff member. Additional instructional support came from the professional development online course required of any prospective VHS teacher.

To support teachers in developing their online curriculum and pedagogy skills VHS also required developed two online professional development modules. The first, a 26 week long, 12 credit Teachers Learning Conference (TLC) course, was used to train teachers to develop new online courses. A variety of content experts, technology experts, and experts in Internet-based work were tapped to create this professional development course. Part of the teachers' work during the TLC was to prepare a syllabus and at least some of the materials that would be used in teaching their proposed course to students. After completing it, a candidate's proposed course was evaluated to determine if it was suitable for inclusion as VHS NetCourse.

The second professional development offering, the fifteen-week, 6 credit NetCourse Instructional Methodologies (NIM) course, trained teachers in online teaching methods so as to prepare them to take over an existing course, such as when a teacher left or to create additional section of a popular courses that had already been developed.

Occasionally teachers needed participating students to receive a packet of materials in the mail before the course began. For example, students in the Hands-on Physics, Introduction to Stellar Astronomy, and other science courses received laboratory materials that would later be used to complete course assignments. The VHS central staff provided the support to copy and mail the materials to the site coordinator at the schools where the students were enrolled, who then distributed them.



The VHS central staff also provided some technical assistance to faculty, staff and students at participating schools. The Technical Support/Help Desk Specialist resolved all questions about access, and other day-to-day problems. A Technical Projects Manager oversaw this staff member's work and also did troubleshooting of technical support issues, dealt with technical vendors, and oversaw the overall VHS website. At their school site VHS faculty, staff, and students had to rely on whatever technical support was available to them there.

### ***Context Beyond the School***

In an August 2000 interview, Harvard Professor Chris Dede remarked that he does not expect anyone to be talking about distance education in 10 years. He "just expects distance learning to become commonplace in American high school--just one more method of teaching and learning." ("Technology Creates Virtual Schools," 2000).

Dede's prediction seems accurate. As of March 2002, a search of the web for State-level virtual schools and other schools operated by state education agencies identified fourteen different states with such programs. In addition, another 25 virtual schools operated by public school districts and other local education agencies were identified. There were also many school listed under the following category headings: "Virtual Charter Schools operated by state-chartered entities", "Virtual Schools Operated by Private K-12 Schools (state licensed or regionally accredited)", and "Virtual Schools operated by Regional Agencies and Consortia of educational entities, non-profit and for-profit organizations. The same site, [http://www.dln.org/k12/virtual\\_list.html](http://www.dln.org/k12/virtual_list.html). also identified many schools under the headings of "Other Virtual Schools, including virtual home schools and other private schools" and "Private For-Profit Companies offering curriculum, content, brokering services, virtual school infrastructures for customers nationally." Clearly, Internet-based learning for high school students is on the rise in the United States.

## **Improvement in Teaching & Learning**

### ***Curriculum and Assessment Aspects of the Improvement***

Because this school exists mainly in cyberspace, an actual site visit for this case study was not appropriate. Instead, three online courses were selected for in-depth review in order to illustrate the range of curriculum and assessment that took place in an VHS course. The courses selected were Survey of African-American Literature, Biology II, and Visual Basic 6.

The curriculum of these, or any, VHS course was dependent upon what the teacher of the course had proposed. Often proposed courses were favorites of the teachers' or were offerings developed out of teachers' particular interests, but perhaps would not garner sufficient enrollment if only offered to their home institutions' students. In some cases, where schools wanted to expand the courses available to its students, having a teacher develop a course to offer to others was a specific strategy to do so. Although, as mentioned, during the professional development course teachers took prior to starting to offer their course, the VHS central staff provided oversight and assistance as needed.

The pace and style of instruction in each VHS course was also determined by the course instructor. This included how to make use of the LearningSpace functions as well as other



Internet resources. In the examined courses' syllabi the stated learning objectives illustrated this. The Survey of African American syllabi state one course objective was "To use Internet resources to research various historical events affecting African American literature." The Visual Basic course went even further by stating that "the experience of actively engaging the learning process by working collaboratively through the Virtual media will offer you all of the benefits that lifelong learning skills can provide."

The assessment practices were also determined by each teacher. In the three courses, Survey of African-American Literature, Biology II, and Visual Basic 6, the assessments varied widely. In the Biology II course, many different types of assessment were used and the VHS teacher actively kept the students apprised of their grade. Assessments included multiple choice tests, research assignments, and shorter weekly assignments. In Visual Basic 6, the student's grade was mainly derived from the assignments posted and reviewed in the course room. The Survey of African-American Literature had a portion of the student grade based on participation in group discussions of literary selections, among other assessments such as research on historical background of literary periods, weekly quizzes on literary selections, evaluation of related websites, and creative writing.

To assist with the record keeping, the site coordinator at the students' school was usually the teacher of record and entered the students' grades. It was the consortium school where the student attended that awarded the credit to a student for successful completion of an VHS course.

### ***Teacher Practices and Outcomes***

VHS teachers designed and offered their online course in addition to their regular teaching responsibilities at their home schools. Participating schools released an VHS teacher from teaching one section of a regular course, allowing them to substitute the teaching of an VHS NetCourse.

Whereas other distance learning approaches, such as audio teleconferencing or interactive video, assume participants are interacting from different places at the same time, the VHS courses were all asynchronous. Another key feature of the VHS approach was its ability to support many-to-many interactive communication; that is, teachers could interact with one or all students as they chose, and students could interact with each other to collaborate on projects, discuss topics, and debate issues. These features both influenced the instructional practices of teachers, as did the fact that the courses required computer and Internet access and skills.

Although VHS teachers used a variety of pedagogical approaches, such as cooperative learning, inquiry-based projects, and performance-based assessment, each lesson had to be carefully planned so that it would "work" in an online format. Especially if the teacher had previously taught the VHS course in a face-to-face format the teacher had to "translate" their pedagogy. For example, student projects that needed great amounts of a teacher's attention, or required a long list of materials would maybe need considerable adaptation, or perhaps would just not be suitable for online courses. Teachers would instead need to demonstrate the concepts in different ways, perhaps by developing new assignments, or searching out websites that could provide grade-appropriate demonstrations. Course syllabi for the VHS point to a variety of other instructional methods used in online courses, in addition to the predictable web searches or online discussions. These included the construction of models

(such as airplane gliders), independent field trips (to determine local architectural style), or written journals maintained off-line.

Teachers generally enjoyed the increased flexibility provided by the asynchronous nature of NetCourses. In addition, VHS teachers reported that their technological capabilities increased. As indicated by survey results reported by the VHS project evaluators, in 1997-98, 59% of teachers indicated that they were "very satisfied" with the flexibility they had in teaching their VHS courses. In 1998-99, that percentage increased to 75%. The percentage of teachers indicating that, as a result of VHS participation, they acquired new technological skills was 79% in 1997-98 and 82% in 1998-99. Teachers indicated that they were using their new skills outside of VHS in comments such as, "This [VHS] course has increased my computer knowledge and I have used it in other classes." Example skills mentioned included managing a variety of electronic file formats, operating HyperStudio software, and consulting cyberspace experts.

For all three courses in this case study – Survey of African-American Literature, Biology II, and Visual Basic 6 – the role of the teacher was that of facilitator. However, the nature of the teacher participation and teacher-student interaction varied greatly. The Visual Basic teacher corresponded quite frequently with his students about assignments and problems and most of these exchanges were in an open discussion forum for all the course's students to read.

In some courses, such as Survey of African-American Literature, online discussion, where students shared well thought out opinions, was the principle mode of interaction. An example from the Survey of African-American Literature course illustrates the analytical and thoughtful comments students posted to the teacher's question. Here, the student discusses a poem's use of humor.

In Sojourner Truth's argument, *Ain't I a Woman?*, her use of humor strengthens her argument because she compares her capabilities to men in a light way. I think that humor has a place in serious debates within reason. I don't think that debate based about a serious problem that is strictly humorous will be as effective as a debate that has some humor but is not a big joke.

The teacher of this literature class rarely posted a comment to the whole class, instead preferring to correspond one-on-one with students regarding assignments.

The Biology II teacher had the most entries, and on all sorts of topics, from assignments, to grades, to assessment modes. The Biology II teacher to student interactions focused more often on completing assignments and alerting students of their grades and missing assignments. Here's a typical short question-answer exchange from the Biology II teacher about a student's grades.

Your midterm grade for term 2 is pretty good. I have grades for all assignments except two. You are missing week 31 "Contracting with Nature" which is a partner assignment. If you don't have a partner, check with Lauren. She is looking for one. You must also complete week 31 "Pasture Profits" assignment. Currently, your average is 82% B-."

Each VHS instructor was responsible for managing and monitoring his or her own VHS NetCourse. They were responsible to reinforce the VHS-wide expectations for student attendance and behavior. The site coordinators could serve as a support to teachers in following up on students who were absent from online participation too often or whose grades were low. During the second year of course offerings the project's evaluator

interviewed teachers about their feelings of efficiency and effectiveness in managing the logistics of teaching on-line. The respondents indicated that they felt efficient and effective in their course management. It should be noted that at that point more than 60% of VHS teachers had at least one year of on-line teaching experience. Experience in the NetCourse teacher role perhaps contributed to this confidence and satisfaction with their courses.

Overall, in both the first and the second year VHS offered courses, its Teachers indicated that, as a result of their participation in VHS, they had acquired new or increased their subject matter knowledge, and further developed their pedagogical skills (see Table 1).

Table 1.

teacher benefits of participation in VHS	% of teachers year one	% of teachers year two
Acquired new subject matter knowledge	59	61
Increased existing subject matter knowledge	86	88
Acquired new teaching or assessment skills	69	70
Accessed pedagogical expertise	66	70

Data from An Evaluation of the Virtual High School After Two Years of Operation, November 1999.

VHS teachers also indicated an increase in interactions with teachers at other schools (82%). A majority of principals (77%) and superintendents (76%) agreed that, as a result of participating in VHS, teachers had the opportunity to collaborate and/or network with teachers from other schools and districts. Teachers also reported having benefited from the exposure the project provided them. One teacher had given several presentations on her VHS course at Stanford University and at teacher conferences. Another teacher was featured in an article about VHS in an issue of *U.S. News and World Report*.

### **Student Practices and Outcomes**

The students of VHS are all drawn from the schools that comprise the VHS consortium. In year two of its operation (1998-1999), based on these schools' principals' reports, the average proportion of nonwhite students among consortium schools was 29%; the national average for high schools at that time was 34% nonwhite students. Six VHS schools, or 17%, had an enrollment of more than 50% nonwhite students and in slightly more than a third of the schools, white students made up 90% or more of the enrollment. In year 1, baseline data from principals and superintendents showed that the VHS schools had, on average, 18% of their students receiving free or reduced-price lunch, only slightly less than the national average of 22%.

Students in VHS were often informally qualified for admission by teachers, site coordinators, or guidance counselors at their school. Although no formal policy to screen students exists, the VHS faculty handbook states "Although all students should have access to the VHS catalog, we recommend that the school site coordinator and guidance counselors select students who can work independently and handle responsibility."

The typical VHS student has changed over the years that the program has been operating. VHS was serving a fairly narrow range of students during its first year of operation (1997-98), specifically those who were academically advanced and college bound. During the 1998-1999 school year, site coordinators and principals reported that the students taking VHS

courses had a wider range of academic success and were more representative of the full range of socioeconomic backgrounds present in their school than they were in year 1. In year 1, only 13% of site coordinators reported that VHS students had a wide range of prior academic success. In year 2, that percentage rose to 31%. Similarly, whereas 26% of coordinators in year 1 claimed that VHS students had high/exceptional academic performance, only 4% claimed such an academic history for their VHS students in year 2. Most site coordinators (58%) reported that VHS students came from economically disadvantaged backgrounds as much as other students at the school, a significant increase from year 1, when only 29% of site coordinators made that claim

Students' decisions to take part in NetCourses were made at the same time as regular course registration at their school. In fact, it proved quite a challenge for VHS to have descriptions of the NetCourses available to students in time, as high schools' normal course sign-up procedures takes place in early spring for most schools. Some VHS schools restricted the number of online courses a student could take per semester and required the completion of prerequisites before registering for a course.

Most schools had additional criteria that further limited the number of students taking a VHS course. (It's important to keep in mind that only 20 students from a school can sign up for a VHS course for every single VHS course originating from a teacher in that school.) Schools often required that VHS students be juniors or seniors, with the expectation that older students could handle independent online study better than sophomores or freshmen. Other criteria employed by some schools included cutoffs for grade point average, days absent or tardy, and required letters of recommendation. A majority of site coordinators said that most VHS students had above-average or exceptional academic backgrounds and were college bound. This skewing of average student characteristics was perhaps symptomatic of the rigorous criteria set by some schools. Nonetheless, teachers and coordinators both expressed concern that unless such criteria were in place many students would be set up for failure.

Once a student enrolled in a course, the rules for when and where to conduct VHS work varied by school. In some schools, VHS students were allowed to use any school computer in a study hall or media center to complete VHS work, while in other schools, specific time periods were assigned to students so that they can go to their "VHS class." Often, a bank of computers in a lab or classroom became designated for VHS, and students attended that class or lab as they would have any other regular class. Since students were able to log into VHS from home, just about every student who had a home computer completed some VHS work at home. Course logs showed that typically students logged in and participated in the class several times a week, as well as completing work off-line.

Although students did not need any special software to access courses developed with LearningSpace, they had to learn how to use it. For example, how to send their assignments through the Internet and participate in student discussions. Starting in the spring 1989 semester, VHS central staff required that all the VHS NetCourses begin with a week-long unit for students on how to work with LearningSpace. A short handbook for students was also made available through the Web.

In each course grading criteria were to be very explicitly stated and just about every course had a syllabus that outlined topics and assignments. From the teachers' point of view, students had little excuse for not completing assignments or projects. Nonetheless, appeals from students were not uncommon, particularly toward the end of the course. In the quote

below a Visual Basic 6.0 student pleaded his or her case as to why the teacher should provide him or her another chance, and cites both technical and emotional rationales:

I passed in those programs again. I had sent the programs in right after you had told me that there was something wrong with them. There seems to be a problem with the server and disappearing files, or something went wrong. I can never tell with your portfolio thing what my grades are it is so confusing. I thought you had received the program because when I checked if they had been sent or not it said that they had been sent. I am very concerned and upset about my grade because I am a very hard working student. I am 7th in my class and have never gotten below a B before. I am fighting for class rank and for scholarships for college. VHS is a weighted class and it has been very hard for me deciding on what to do. I need the grade to be high very badly because it means the difference between thousands of dollars next year. I will do extra work if you want, but I have tried my best in the amount of time that I have to work as hard as I can to do my best that I can in this course.

An examination of the CourseRoom module (threaded discussion area) of these three courses revealed student to student interaction was rare. Some courses made other venues within LearningSpace available for students to interact. For example, the Visual Basic course, where students had a de-stressing room and a de-bugging room to interact with one another, ask each other questions, and be teenagers in general generated more student interaction than the other two courses.

The Survey of African American Literature class was a better example of the more typical level of student to student interaction. In a few instances, students commented on other students' comments in the CourseRoom, but usually they simply answered the questions posed by the VHS teacher. A few courses did have students working in "Virtual" groups or sharing a project with a partner, but for the most part, the assignments were to be done independently.

The VHS web site had an online "lounge" area outside of any class that was designed for students only. Its link advertised that students should "Come hang out in the central meeting place for all VHS students. Access your courses, chat and make new friends, read the student FAQs, and keep up -to-date with the latest student announcements. Get to know your classmates!"

According to the annual evaluation reports of the VHS project, students reaped two major benefits from taking NetCourses: the availability of new course options and flexibility in scheduling. Although student surveys did not have a response rate suitable for statistical purposes, most students who did respond reported that taking a course that would not have been available otherwise was a major benefit of VHS. Students also consistently indicated in interviews and comments on the surveys that the increased flexibility of scheduling their work and the break from the traditional classroom setting were benefits of VHS participation.

Students noted other benefits they gained from VHS participation. One student wrote, "I think asynchronous discussion is wonderful and the most intelligent, deep conversations I've ever had in school have all been in VHS." Another student mentioned the benefit of being able to communicate without physical appearance being a factor: "The people that are within your class do not really see you. It is all based on your mental and not your physical appearance." Students indicated a strong appreciation for the experience of working independently and improving their time management skills as a result of VHS participation.



Several comments from students reflected a sense of pride in monitoring their own work habits and learning material on their own.

Some students also pointed out that many college courses are now taught on-line or have Internet-based components. One student wrote, "I did not enjoy the VHS experience as a whole, but it was a good idea for me to take the class. Lots of colleges are using the Internet for instructional material, and I needed the experience of taking a class on-line." Students mentioned that the VHS experience not only would look favorable on a college application, but that it also prepared them for such experiences in the future.

Students advancing their technological skills was also a benefit of VHS participation. On the question of whether students had more access to or took greater advantage of technological experts as a result of VHS participation, the Evaluation of the Virtual High School After Two Years of Operation, November 1999 reported that significantly more site coordinators this year (91%) than last year (56%) responded that this was a benefit to students ( $\chi^2(1, N=48) = 7.56, p < .01$ ).

On surveys conducted for the project's evaluation, site coordinators appeared to agree with the students' perceptions regarding benefits. One coordinator summarized the benefits of the program for students with the comment, "The Virtual High School experience prepares students...by having them work independently."

While nearly 90% of the open-ended responses to the student survey questions in 1998 and 1999 were positive comments, students did register some complaints about their teacher's practices, the online experience comparing negatively to a face to face class, their expectations for a class not being met, and their frustration over technical problems. Complaints about the teacher's practices were mostly about how the student did not feel the teacher was responsive enough. Students also made note when the class had more or less work or discussion time than they expected; a few offered that they did not think the class had been described accurately, and did not like what it had turned out to be. The complaints about the technical problems were mostly about logging into the VHS site or getting homework assignments posted correctly, including a student's claim that his or her homework had disappeared.

VHS did not determine the student attrition rates, but acknowledged that students sometimes did not "attend" class as expected. When students were not showing up for class, or had failing grades, the site coordinators at the schools, either upon their own initiative or at the request of teachers, could contact the students for a little face to face counseling and check-in.

## **Lessons for the future**

### ***Noteworthy Outcomes***

Participation in the VHS resulted in many benefits to teachers, students, and schools. Teachers acquired new technological skills, new pedagogical and assessment skills, and new content knowledge. They had access to new technology and to technical, subject matter, and curricular experts. Many teachers also collaborated with other teachers from around the country. Students also acquired new technological skills and had access to new technology.

The most pronounced benefit of the program, however, was that schools were able to offer, teachers were able to teach, and students were able to take courses that would not have been available otherwise. Schools participating in VHS added over a hundred courses to their course catalog.

Overall, teachers and students were consistently satisfied with the quality of VHS courses and the overall operation of the project, even though the final project evaluation report found that both teachers and administrators said that the project cost more than anticipated. They went on to say, however, that the additional investment of resources was justified and acceptable, and they would spend these resources again, knowing now what is required. Most administrators said they would continue in the project even after external funding was discontinued.

### ***Added Value from Technology***

The majority of courses offered in VHS were the type that students would choose as electives. VHS project evaluation reports indicated that having the opportunity to offer classes in subject areas for which there would not have been sufficient numbers of enrolled students was consistently indicated as the main reason for participating in VHS. Schools in rural or small school districts particularly benefited because finding sufficient numbers of students to enroll in "niche" courses was difficult.

Site coordinators at the participating VHS schools pointed out that valuable lessons were learned by VHS students because of the high degree of self-discipline and independent learning that was required to succeed in VHS courses. One site coordinator pointed out that by enrolling in an online course students developing the study skills and habits necessary to succeed in a college environment.

A third area in which the added value of VHS is apparent was in the technology use and familiarity with technology that students gleaned from their participation in VHS courses. While most students were familiar with a browser, learning to upload and download files, and obtaining the correct software to open, view, and manipulate files also became a part of the students' learning experiences.

### ***Key Implementation Factors***

The Technology Innovation Challenge Grant funded VHS during the first five years of its existence; it ended in fall 2001, after this case study "visit." While it clearly provided important resources for the start up and development process, part of the project's design was to work towards sustainability. For example VHS charged schools for offering courses (which generated slots for their students to take courses), and the professional development courses. At the time of this writing, the VHS had further expanded its number of offerings and students.

The large infusion of funding that the provided to the pilot VHS program may not be available for similar endeavors in the online learning field. However, there is tremendous growth in similar ventures by state governments, such as Florida and Nebraska, and enormous interest in private sector higher education institutions that exclusively offer online courses.



The cost of employing someone as site coordinator at each VHS participating school paid for out of the grant. This role proved to be a key factor in implementation success. Some aspects of the site coordinator's role were more administrative: program promotion, recruiting teachers and students, and coordinating with local administrators and VHS staff, for example. Student monitoring and coordination was an important and much more time-consuming part of the coordinator's role. Students in case study schools seemed more satisfied in schools where the site coordinators were more involved in student monitoring and support. As the numbers of students, teachers, and courses increased, a single person would have difficulty monitoring students, knowing the requirements of each of the courses that they take, and communicating with the many teachers of these courses.

## **Challenges**

All classes had some minor technical problems. The students e-mailed the problem to the teacher, and the teacher generally responded with a solution.

Evaluations of VHS during the last three years have shown that both students and teachers expressed satisfaction with the level of communication between them; however, "teachers were less satisfied with the level of communication in their VHS courses than in their regular courses." Coordinators actually reported that VHS students communicated less with their teachers and with other students in their on-line courses than in their regular courses. Students in four of five case study focus groups indicated that only a minority of students in their courses were on-line daily. Some students also noted the impersonal quality of the courses. Within the current structure of LearningSpace, some courses seemed to generate more interactions than others. Again this variation could be a consequence of the subject matter and the design of the course. Certainly the level of interaction overall was greater among students in Visual Basic 6.0 than among students in other courses because students had use of alternate "rooms."

The response lag to questions or conversational turns in asynchronous communication reduces the responsiveness of the system and the sense of community. This condition may be more of a structural problem that is inherent in asynchronous instruction and, as such, solutions may not be easy to find. The addition of synchronous communication and the opportunity for cross-course communication may increase the amount of interaction within the system.

Another challenge area to VHS is the assurance of high course quality. Administrators in several schools indicated that they expected and assumed that the VHS course offerings were of high quality. One administrator pointed out that he treated VHS courses like transfer courses; the quality was taken for granted. Nonetheless, the continued quality of VHS courses is a key to the sustainability and scalability of the project.

## **References**

Chute, E. (2000, August 29). Technology creates virtual schools, giving students more options for learning. *Post-Gazette.com, August 29, 2000*. (<http://www.post-gazette.com/regionstate/20000829distance4.asp>)

**Evaluation Reports Drawn upon in this Case Study**

Espinoza, R., Dove, T., Zucker, A., & Kozma, R. (1999). *An evaluation of the Virtual High School after two years of operation*. Menlo Park, CA: SRI International.

Kozma, R., Zucker, A., & Espinoza, C. (1998). *An evaluation of the Virtual High School after one year of operation*. Menlo Park, CA: SRI International.

Yamashiro, K., & Zucker, A. (1999). *An expert panel review of the quality of Virtual High School courses: Final report*. Menlo Park, CA: SRI International.