

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

***Canutillo Elementary School: Using Technology to Support
Constructivist Learning Environments***

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Canutillo Elementary School: Using Technology to Support Constructivist Learning Environments

Case Overview

Canutillo Elementary,¹ a public K-6 grade school, is located in a small town in the high desert outside of El Paso, Texas. This was an economically depressed area: all of the students qualified for free lunch. The ethnic heritage of the 675 students was approximately 96% Hispanic, 3% White, and 1% other. Many students were either native Spanish speakers or bilingual.

Creating constructivist learning environments supported by technology became a schoolwide focus at Canutillo starting in 1998, when the school took part in a two-year professional development program offered by a regional education lab. School leaders embraced a constructivist view of learning. They incorporated it into the school's mission statement and encouraged and supported teachers in implementing it. Teachers designed lessons so students actively participated in learning, formed understandings, and made connections. The teachers at Canutillo created lessons that enabled students to work together and to make products that showed what they knew and what they could do.

Many of the computer resources were classroom-based, so the innovation could be employed several times a week. (The number varied by teacher.) The number of students per class and the nature of the activity determined whether rotations of groups through the computer stations in each class were viable. These and other logistical considerations may have deterred some teachers from implementing the innovation more frequently.

The innovation was schoolwide and involved all curriculum areas. About 70% of the forty teachers attended the formal training. Of them, it was estimated that 50% to 80% regularly used technology in support of constructivist learning environments.

Implementation Context

History of Innovation

The school's focus on constructivist learning environments supported by technology developed in the spring of 1998 from the school's involvement with the Southwest Educational Development Laboratory's (SEDL) Technology Assistance Program (TAP) grant. The goal of the program was to create models of constructivist learning environments supported by technology. The staff from SEDL provided the school with onsite professional development six days a year for two years. Twenty-eight of the school's forty teachers participated in the Technology Assistance Program.

¹ This school is sometimes called Canutillo Primary, but its official name is Canutillo Elementary School. It should not be confused with Canutillo Middle School or with the Canutillo Independent School District.

About the same time, the school also started a dual language program to better accommodate the needs of students, for whom English was often their second language. The school offered two programs to address this. The first provided bilingual classrooms for non-native English speakers, where most instruction was in Spanish. Gradually students developed their English skills, leaving sixth grade fully bilingual. The second was a dual language program, in which two classes mixed native English and native Spanish speakers. These classes were assigned a pair of teachers, one who taught entirely in English, the other taught in Spanish. The students alternated between the two teachers, and helped one another learn the other language. This program is now offered from kindergarten through the fourth grade; it will expand by one grade level each year. The school also has monolingual (i.e., completely) English classes. The students were divided about equally between these three types of classrooms.

At Canutillo Elementary School, constructivist learning environments were combined with bi- and dual language instruction and so the school provided an opportunity to learn how technology could support both efforts.

School Culture, Professional Community

The Principal, Hector Giron, committed the school to participating in SEDL's TAP program. Principal Giron made it clear to the staff that the creation of constructivist learning environments supported by technology was a top priority for the school. As he put it,

This is a campus plan . . . If you are going to work here, you need to do it. If not . . . You can teach somewhere else where maybe they don't do this . . . Getting to learn how to use the technology and implement it, the pace you do it is optional; actually not doing it is not optional.

With the grant and school funds, about 70% of the teachers participated in the activities. The principal arranged for the remaining teachers to learn about the innovation through after-school sessions and other, more informal, methods. At the same time it began the TAP program, the school established a technology committee to advise on technology purchases and related issues. A representative from each grade level sat on this committee. The school district also provided a half-time Lead Teacher for Instructional Technology who supported the integration of technology into instruction through collaborative planning and co-teaching. The paired teachers in the dual language programs also worked collaboratively on instruction and technology integration.

The principal estimated that about 80% of the teachers who participated in the TAP program had embraced the goals of the innovation. The former Lead Teacher for Instructional Technology (who was assigned to the school the year before we visited) estimated that 50% to 55% of the teachers were regular users of technology.

The teachers to whom we spoke indicated that they were working to learn more about constructivist learning environments supported by technology, and about how to incorporate the innovation in their classroom. They spoke very favorably of the support they had received to date.

The principal was a strong leader who knew how to initiate change in schools. He handled the communication and coordination necessary to set expectations for change, and provided support for it, too. His efforts were complemented by the involvement of teacher-leaders on the technology team and in the dual language program. The district leadership was rarely mentioned as either a contributing or inhibiting influence on the school's work.

The innovation at Canutillo Elementary hinged on staff members' understanding of what must be included in a constructivist learning environment that used technology. Through SEDL's TAP program, the majority of the teachers and the principal came together around the goal of creating such an environment in the classroom. The principal understood that this approach was a change for some staff, and he worked to provide both pressure and support to help them move in that direction. He also recognized that such change would take time:

I believe that you are talking about institutionalization of a reform process, or institutionalization of a change process. . . .this is about a 3-to-5 year process. And if you're going to start something, then you have to really support it, really commit to that, and I feel that we've been doing that. The sustainability of this comes, first of all...[from] the training and staff development, the support that you offer staff in order to keep up to date, keep fresh with the technology, understand applications, understand new technology.

Professional community among the teachers was strong, especially between the dual language teachers at the same grade level. There was frequent and substantive collaboration between the teachers, so that when the students switched teachers, teaching and learning could proceed without interruption. The teachers needed to work together on curriculum development to ensure that students in both the Spanish and the English versions of the class would learn the material.

Technology and Technology Support Structure

The school has one and one-half full-time staff assigned to it for technology support. There was a full-time network technician who maintained the network, installed software, and fixed problems with the computers. The person in this role was new the year we visited; prior to that time, an aide with an instructional background held the position for seven years. Several staff members described her instructional background and extensive experience as very helpful; they were frustrated but sympathetic as a new person began to learn the job.

The district assigned a resource teacher for technology integration to Canutillo on a half-time basis; this was up from a quarter-time basis the three years prior. This Lead Teacher for Instructional Technology worked with teachers to develop projects and then supported their implementation of technology in the classroom and in the computer lab. She would teach teachers and students about the technology or would lead a class, or would serve as an additional adult in the classroom, depending on what was needed.

Each classroom had three or four networked computers and a printer. The media center had twelve networked computers, two printers, and two video projectors that teachers could check out. There was also a small computer lab with ten computers, which teachers signed up to use. The school also had two digital cameras as well as a cart equipped with five wireless networked laptops and a computer with a 32-inch monitor for teachers' classroom use.

Having computers in the classroom saved time because teachers did not have to move their students to another location. The number of students in the classes we observed ranged from eleven to approximately twenty. The actual class size determined the number of rotations needed to get every student on a computer. Teachers did not complain about the student-to-computer ratio, except when some computers were not working, which meant they had to adjust plans.

The software available included word processing programs such as Lotus and Writing Center; multimedia and presentation software such as HyperStudio and PowerPoint; Web browser and authoring software; Excel Spreadsheet; and the Reading Renaissance programs (Accelerated Reader, S.T.A.R., and other advanced learning information systems). In addition, the school used desktop management software called School Net Vista; its protective features generated complaints from the teachers, but garnered the approval of the network technician.

The software programs allowed students to show what they were learning in the form of products (e.g., PowerPoint or HyperStudio presentations, Excel graphs), and test results (i.e., Accelerated Reader results). Teachers were served because learning became more active for the students, and because the products provided a measure of what students knew and could do. The teachers and students also used the software to search the Internet for information, which helped teachers to illustrate points in their lessons. Students were able to choose topics for study without worrying about whether the classroom or library had sufficient print resources.

The teachers integrated technology into lessons as they saw fit. Thus, the entire regular curriculum could be supported by technology. The Reading Renaissance program was integral to the language arts curriculum.

While constructivist learning environments can be created without technology, the TAP training influenced teachers to see educational technology and constructivist learning environments as complementary. For some teachers, the two-year professional development program provided their first exposure to either concept and, consequently, many of this school's teachers saw technology as essential in supporting constructivist learning environments, which was this school's official policy. The principal and the school's technology team kept this in mind as they made purchases and decisions.

The school technology provided students with another important benefit: access to computers. Because it was an economically depressed area, most students did not have computers at home; the school provided their main, or, in many cases only, access. Because of this, the school technology team offered parents several chances to come to the school to learn about computers; the school technology team had a goal of doing this more often in the future.

Context Beyond the School

At the time of our site visit, the Texas Essential Knowledge and Skills (TEKS) was a state curriculum framework that described what students should know and do in all subject areas at each grade level. Students were tested on this knowledge using the TAAS (Texas Assessment of Academic Skills) test. The TAAS tests were skills-based, and focused on math, reading, writing,

and science. These tests served as perhaps the most important summative indicator of a school's quality. The teachers felt that they must ensure that students developed these skills by grade six.

While the TEKS standards included technology competencies, there were no assessments associated with those skills. But the staff was committed to helping students master the technology components of the Texas Essential Knowledge and Skills (TEKS) requirements, working within the context of constructivist learning environments. School documents and staff members stated that the school's goal was to integrate technology into all core areas of the curriculum.

State policies related to funding also affected what the school could do. Texas passed a Technology Infrastructure Fund (TIF) bill, setting aside money for the purchase of equipment. The area's federally sponsored Regional Education Laboratory, SEDL, created a program that was central to Canutillo Elementary staff members' vision for technology use and their pedagogical development. The school also sought and received grants from other entities. Altogether, these funding sources for professional development and equipment pushed Canutillo Elementary beyond other schools in this district.

Improvement in Teaching and Learning

Curriculum and Assessment Aspects of the Improvement

The curriculum goals derived from local and state curriculum frameworks, especially the TEKS requirements. Because schools were judged by their students' mastery of TEKS standards, the TEKS must be treated as central curriculum goals.

As described earlier, a schoolwide goal was to create constructivist learning environments; this resulted directly from the school's involvement in SEDL's TAP program. The other schoolwide goal was to develop students' reading skills; this reflected the current focus in the U.S. on age-appropriate skill level development.

The innovation at Canutillo Elementary was concerned with instruction rather than with curriculum. Staff members using constructivist learning supported by technology did not change the content of the curriculum; instead, they changed the way students encountered and engaged the subject matter. For example, teachers molded the curriculum into thematic units that required hands-on projects. Students were asked to create a product, which was often where the technology was used. Students could do some or all of this work in word processing, multimedia, or graphics programs.

Related to this shift in instruction was a change in assessment. While the TAAS, Texas' achievement test, was important as a summative measure, and teachers still administered paper and pencil tests, teachers also noted that products made from students' use of the tool software were a good way to establish what they knew and could do. For example, a second grade teacher asked students to make a concept map of what they recalled about a topic. She explained,

Well, one thing I like to do instead of doing a paper-pencil test . . . is use Inspiration . . . [for] graphic organizing. Instead of testing them, I'll send them in pairs to the computer

and you come up with a web of the things that you have learned in this unit. And I like to just do things like presentations where they are developing not only their written skills but their reading skills, their oral presentation skills, and their speaking skills too. And I think that the whole SEDL experience [with] technology . . . has definitely changed my view of what is proper assessment; I mean before I would have thought that you have to sit down and take a written test, now I rarely do.

In summary, at Canutillo Elementary the technology supported students mainly in accessing information and showing what they know.

Teacher Practices and Outcomes

Creating constructivist learning environments supported by technology often required teachers to spend more time preparing resources for the students' use. Before students' work could begin, the teachers might have gathered print materials, found appropriate Web sites, or created computer files or templates in which the students could save the information they had found.

The Internet was extremely helpful to teachers for gathering information for their own and the students' classroom use. As one teacher remarked, "It's almost getting to where we wonder what we did before we had the Internet." When we visited, the dual language classrooms were studying other countries in preparation for an open house with an international theme. One teacher reported that she found recordings of national anthems on the Internet; another teacher located translation software so her students could learn some Swahili phrases. A third teacher had her students use the Internet to compare temperatures in Spain to those in Texas, and then graph the results.

Technology was also used to support reading instruction. The Reading Renaissance software program provided quizzes on books students have read. The questions checked their understanding of the story, and both the students and the teachers could access their scores through on-screen and printed reports. In the library, the titles were color-coded to indicate reading levels. Teachers monitored students' progress in part through the program's suggestions that students move up or down a level, depending on their quiz scores. The school had both Spanish and English language titles coded into this system, which enabled the dual language teachers to quickly see students' language skill development in both languages. The program also awarded points to students based on their correct answers; on two days in the year students could use these points to purchase prizes.

The TAP program promoted the role of teacher as facilitator. Some of the teachers said they already were inclined to see themselves as such, while others indicated that this was hard for them and that they needed more support to make the change.

Since the TAP training, teachers assigned work in which the students actively sought information and decided what was important. A fourth grade teacher explained how she set up a learning environment, and her role in it:

You're a facilitator more...Like letting the kids find out a lot of the stuff, not you giving them information but telling them, "Okay, this is what we need to find. These are the means you have to find out this information." Then you kind of let them discover on their

own.... [I]n my language arts block right now, whatever concept I'm teaching I have every center set up and then they have the five centers, and it [activities at the centers] all goes back to the concept....Normally I would have just given the whole lesson and said, "Now you do it." And then when we finish that, I give the next lesson and "now you do it." And this way, after I teach the concept, then I give a whole overview of each center-- what they're going to accomplish in each center and what concept they're going to learn-- and then I step back.

Managing such a resource-rich classroom with simultaneous student activities meant teachers divided their attention. We observed several classes where the teacher worked with one group of students while also keeping his or her eye on other groups, occasionally intervening to settle a disagreement or to remind students to focus on their task.

In the focus group, teachers discussed the school's emphasis on a student-driven teaching style, noting that some teachers were comfortable with it, others less so. The school's Lead Teacher for Instructional Technology attributed this to personality:

The constructivist teacher has a type of personality. I was a constructivist teacher 25 years ago before the word even came up. And I think it is definitely personality. . . . SEDL came in and . . . they train you into that type of a teaching, but it takes a certain person to readily grasp it. You know, I think it is a very slow process to change teachers...

A first grade teacher in the group agreed that a teacher's natural inclination might play a part in success with the approach, but that, with support, teachers can make the change.

I was not a constructivist teacher before we started SEDL. I am trying to change. I am getting there. I changed a lot the way I teach since we have gotten the training. I did centers [before], but the centers were learning centers and I had control over them. That's changed. Now my centers are part of my lessons, my learning. . . . My whole two and-a-half hour block of time--instead of me teaching something and then sitting there doing it-- [students] are rotating through the centers. And it's hard. I'm the one that has to change, but I'm making that attempt.

When asked if she felt like she was losing control, she and all the others in the group responded "Yes!" The first grade teacher elaborated, saying that the need for control stemmed from her interest in keeping students on task, not from her need to be in the center of all activities:

But, it's hard because if you're working with one group on one thing--like the writing right now, and I've got kids over there that are off [task], and I'm the only one in the classroom. And I'm trying to work with this group on writing.... How do you control all of them rotating, and you're the only one there? That's been the biggest change for me. I did not use to teach this way, and I have since we've done SEDL training. It is hard!

About a dozen teachers did not receive the TAP training. The school principal has arranged for teachers who attended the TAP program to work, on an informal basis, with colleagues who did not attend.

Student Practices and Outcomes

During our visit to Canutillo Elementary, we observed various classes several times. Students used computer programs in a range of activities. Below are examples from the second, fourth, and sixth grades.

In Mrs. Almaraz's second grade dual language classroom, students worked on a Famous Americans project. Pairs of students used the Internet and books to research the famous American they had chosen. The teacher had previewed and bookmarked some Web sites that were at the right reading level and that provided appropriate information. The teacher stayed by the computers to supervise while two or three pairs of students used the Internet. The students took notes and printed out Web pages. Returning to the classroom's tables and desks, the students then made a "spider map" (a hierarchical arrangement of the facts) of important information about that person. While still helping the students who were using the Internet, the teacher guided the other students as they worked on their maps. After completing the spider map, each pair worked together to make sentences. They wrote their rough draft on paper first because the teacher felt they needed this step to turn the notes on the map into sentences. The teacher reviewed what they had written, and then students used a word processor to type it up. On the day we observed, the students were using Lotus word processing program.

In Ms. Kelley's fourth grade classroom, the students used the Internet and a multimedia authoring program called HyperStudio to research a city in Spain, which they were studying in social studies. This project brought them into groups of three at various times over the week. Each group selected one of five cities in Spain; the students were to create five cards in HyperStudio and to include at least three pictures as they discussed topics they chose from a list provided by the teacher (rivers, oceans, population, altitude, weather, food, activities, dress, Capital, news, dress and culture).

During the two days on which they had time to use the Internet, students interacted constantly. They consulted one another about what to enter into search engines, which images to select, and which facts to note down. The teacher had given students an organizer in which they listed the URLs they found, a description of the picture, and what, as a group, they had decided to write about their topics. The students seemed very comfortable collaborating; they noted that at times they did not agree but couldn't explain how they work it out--they just do. When they disagreed over facts, they said they went back to the source of information, in this case the Internet.

The students quickly caught on to the new program: the first day the teacher had showed a video about HyperStudio's operation and features, and an example of a stack. After this short introduction, the students were able to proceed with their own work. During our observations of students working on HyperStudio stacks, the teacher had to remind groups to focus on the content before graphically embellishing their project.

In Mr. Bueno's sixth grade social studies class the students were doing a "webquest," or semi-structured search, on the Internet. The students were in groups mixed by ability and bilingual fluency. Because of the limited number of computers and large class size (approximately 25 students), each group averaged five students. Each member had a different role; while it seemed that not everyone was always totally engaged, no one was necessarily off task. The webquest directions were explicit and fact-oriented, and did not call for the use of analysis, synthesis, or evaluation (the purpose of a webquest, as defined by the webquest originator Bernie Dodge). The students were asked to find particular facts about WWII, mainly from certain referenced locations at the Encarta Web site. Although the students were not engaged in a high-level

cognitive task, the Internet was an important information resource, since there was limited information on WWII in the textbook.

In other grades as well, students also used the Internet to research topics. Depending on the age level of the students, they received more or less teacher guidance and assistance. Students used word processing software and multimedia authoring software (HyperStudio) to report what they had learned.

In classes at all grade levels students also used regularly the Reading Renaissance program. During reading time they were able to take Accelerated Reader (AR) tests. The program tracked their quiz scores, and teachers could run a summary report of that information. Because of the school's focus on creating constructivist learning environments supported by technology, students worked in pairs or small groups more often and consequently must learn to collaborate. They were also more frequently given responsibility for choosing what they would study, or how to present what they knew. They also had a clear sense of their current reading level in both English and Spanish.

The Texas academic achievement test, the TAAS test, for Canutillo Elementary school during the time period of the innovation mostly showed improvements. Students were tested at grade levels three through six in reading and math, with a writing test added at fourth grade. Students could take either English or Spanish language versions of the test. Test results from the spring of 1999 and 2000 showed that the schools' third graders taking the tests in either language exceeded by several percentage points the number of students in the state who passed all grade level tests. The long-term performance trends show Canutillo Elementary gains (positive changes) to be considerably higher between 1994 and 2002 than either the state overall or the Canutillo District. The TAAS results, which in 2002 were integrated into the Academic Excellence Indicator System (<http://www.tea.state.tx.us/perfreport/aeis/>), indicate that Canutillo Elementary gained 50% across all tests (math, reading, writing) for grades three through six in those eight years, whereas the equivalent State gain was 30%, and the district 40%. These gains were based upon the percentage passing the tests, which in 2002 for all tests was 87% for Canutillo Elementary and 82% for the State. Canutillo Elementary's gain for 1994 to 2002 in reading was 31% but the state's was only 15%. The trend in Canutillo Elementary's improvement in performance was steeper in years 1994 to 1998; however, in the years 1998 to 2002 the rate of improvement averaged 4% per year. Given all these statistics, the state gave Canutillo Elementary a 2002 "Campus Accountability Rating" of "recognized," which was not the highest rating ("exemplary"), but was higher than the "unacceptable" or "acceptable" rating. Overall Canutillo Elementary has been demonstrating very impressive performance on these standardized tests, given that their instructional improvement program was oriented in part toward learning objectives that tend to be neglected in state accountability systems. The principal of Canutillo Elementary School reported that, with the innovation underway, students were more excited about learning and had increased their level of comfort with technology. He also emphasized that the use of technology was important because it gave students experiences and helped them to develop skills they would not have an opportunity to do at home, and that he thought this "opened their eyes to new possibilities in their future."

Lessons for the Future

Noteworthy Outcomes

The use of technology at Canutillo was both deep and wide. A majority of the teachers sought to use technology regularly, and were focused on bringing added benefit to student learning and their teaching through doing so. The school leaders officially identified technology as a central resource for teaching, and committed school resources and sought additional resources to support professional development and the acquisition of hardware and software. At the time of our visit, an estimated 60% to 80% of the teachers who participated in the TAP program had embraced the goals of the innovation.

Staff reported that students appeared to be more interested and excited about learning now. For the most part, students have shown gains in the overall number of students who pass the state's TAAS tests and at some grade levels in some years have exceeded the percentage of students at the state level who have passed these tests.

Added Value from Technology

Technology helped teachers at this school to track students' reading skills in both English and Spanish. This was very helpful in the bilingual and dual language classrooms. Because few of the school's students had computers at home, the school was an important avenue for students' access to technology resources and skill development. These resources were used in the classroom to help teachers see what students knew and could do, through the production of products, and the completion of drill and skill exercises. Technology also served as an important resource for the teachers in implementing constructivist learning environments in their classrooms.

Key Implementation Factors

At Canutillo Elementary School, the adoption and implementation of creating constructivist learning environments supported by technology was greatly aided by the district's provision of a Lead Teacher for Instructional Technology and the two-year SEDL TAP program. Both of these were provided by outside resources, one was the result of district policy and the other was obtained through a federal grant.

Much of the power for sustaining the school's efforts came from the staff's commitment to innovation. Thus, willingness of the staff to change their instruction was a key implementation factor. The principal said that he encouraged teachers who did not want to use this method to work elsewhere.

Given that the practice was not used by all of the teachers, the principal will need to continue to provide support (such as new equipment and professional development) and to apply steady pressure (such as expectations to use technology) to advance the innovation among the staff. Several staff members mentioned that the large number of teachers who participated in the TAP professional development was helpful because it allowed for collaboration on the innovation, and created a momentum for it within the whole school. The principal was committed, providing new

equipment to the teachers and creating professional development opportunities for them. Furthermore, he felt it was important to allow time for peers to learn and collaborate together. He planned to commit both time and money to meet these needs. He would use existing funds and continue to look for donors and apply for grants.

Challenges

The school and district have allocated funds for technology and its support, which bodes well for the sustainability of the school's efforts; yet, the school has also benefited greatly from grants, a less stable form of funding. For example, the main professional development for the innovation was funded by a grant. Should the school be less successful in its grant writing, the innovation might be threatened. The principal and staff members were aware of this, however, and planned to build ongoing purchases and professional development into their school budget.

Factors at the district and state level that could impact the school included the district leadership for technology and the state's testing policies. The district appointed a new director of technology just after our site visit, and the effect of this on the school's efforts is unknown. The TAAS test could pose a threat, because its multiple-choice format emphasizes discrete facts over large concepts. Teachers might feel that the innovation takes time from preparation for the TAAS test.