



## APPLE CLASSROOMS OF TOMORROW

**Integrating Technology  
into Classroom Instruction:  
An Assessment of the  
Impact of the ACOT Teacher  
Development Center Project**

### **Authors**

Cathy Ringstaff  
Keith Yocam  
*Apple Computer, Inc.*

Jean Marsh  
*Independent  
Educational Researcher*

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# Research

**A**pple Classrooms of Tomorrow (ACOT<sup>SM</sup>) is a collaboration—initiated in 1985—among public schools, universities, research agencies, and Apple Computer, Inc. In ACOT classrooms, students and teachers have immediate access to a wide range of technologies, including computers, videodisc players, video cameras, scanners, CD-ROM drives, modems, and on-line communications services. In addition, students can use an assortment of software programs and tools, including word processors, databases, spreadsheets, and graphics packages. In ACOT classrooms, technology is viewed as a tool for learning and a medium for thinking, collaborating, and communicating.

ACOT's research has demonstrated that the introduction of technology to classrooms can significantly increase the potential for learning, especially when it is used to support collaboration, information access, and the expression and representation of students' thoughts and ideas.

Realizing this opportunity for all students, however, requires a broadly conceived approach to educational change that integrates new technologies and curricula with new ideas about learning and teaching, as well as with authentic forms of assessment.

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*This report presents research findings from Year Two of the ACOT Teacher Development Centers project, a model of teacher development that goes beyond the traditional teacher in-service experience. Participating teachers learn by observing and working extensively with accomplished ACOT teachers and students during actual school days.*

## **Abstract**

With support from the National Science Foundation, the ACOT Teacher Development Center project creates a new model of teacher development, situated in a context of practice and utilizing the expertise of accomplished classroom teachers. This report presents research findings from Year Two of the ACOT Teacher Development Centers. Following an overview of the project and research methods is a description of the variety of ways in which participating teachers report changes in their instruction and in their roles, particularly in sharing their new knowledge with colleagues. Finally, we describe some of the factors that influence the extent to which participating teachers change their practices, including features of the project and features of their school environment that facilitate or hinder instructional change.

## **Project Overview**

In September 1992, Apple Classrooms of Tomorrow (ACOT), the National Science Foundation, and the school districts of Columbus, Ohio; Cupertino, California; and Nashville, Tennessee joined to create the ACOT Teacher Development Center project. The project creates ACOT Teacher Development Centers in each site that prepare participating teachers to do the following:

- Create inquiry-based, collaborative, and knowledge-building tasks focused on math, science, history, and language arts.
- Use a wide variety of technologies as tools that support learning through composition, collaboration, simulation, and guided practice.
- Implement a portfolio assessment strategy that includes both student products and performance samples and that increases students' involvement in, and reflection about, their own learning process.

The ACOT Teacher Development Center project offers a model of teacher development that goes beyond the traditional teacher in-service experience. Participating teachers learn by observing and working extensively with accomplished ACOT teachers and students during actual school days. ACOT calls this *situated teacher development*, because participating teachers are situated in a context of practice.

ACOT Teacher Development Centers also differ from traditional forms of staff development because activities are learner-centered and interactive. The design of the ACOT Teacher Development Center is based on the premise that learning should take place in an environment that provides learners—*students and teachers*—with the opportunity to construct and interpret meaning for themselves, rather than in an environment where a teacher only “transmits” information to learners. In this type of environment, learners have more ownership of, and responsibility for, their learning. The Teacher Development Center project’s constructivist design models the types of learning environment implemented in ACOT classrooms.

ACOT Teacher Development Centers were established in three schools where ACOT has already made major investments in technology, teacher support, and professional development: Stevens Creek Elementary School (K–6), Cupertino, California; West High School (9–12), Columbus, Ohio; and Dodson Elementary School (K–5), Nashville, Tennessee.

The ACOT Teacher Development Center program has three major components: weeklong practicums during the school year that introduce teachers to new

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instructional tools and strategies in working classrooms; four-week summer leadership institutes that provide the same introductions to new techniques with added time for practice, reflection, and preparation of strategies to engage additional teachers from participants' schools in development activities; and follow-up support extended by ACOT Teacher Development Center coordinators on an ongoing basis for one year following teacher attendance at a practicum and/or summer institute. Both the practicums and the summer institutes require participants to implement projects in their own classrooms.

Although the specifics of the curriculum for participants differ from week to week and from site to site based on the interests and background of participating teams and the students, all participants do the following:

- Observe and reflect on a variety of teaching strategies, including direct instruction, team teaching, collaborative learning, project-based learning, and interdisciplinary learning.
- Use computers, productivity software, camcorders, and telecommunications as tools to support learning.
- Interact with students in real classrooms.
- Share knowledge and experience with colleagues.
- Read and discuss pertinent research literature.
- Create specific plans for technology use in their own classrooms and schools.

Technology plays a central role in the ACOT Teacher Development Centers, as catalyst and tool for instructional change. Yet the purpose of the program goes well beyond teaching specifics about hardware and software use. Many of the skills and teaching techniques used are applicable in classrooms that have minimal technology. ACOT Teacher Development Center coordinators facilitate the exploration of issues including the design of challenging learning tasks; purposeful student interactions; flexible, authentic learning situations; the use of an array of technology tools; and the importance of alternative forms of student assessment.

To participate, teachers are required to have access to at least one computer, a printer, and appropriate software to assist them as they learn to integrate technology in their regular classroom. Moreover, teachers are required to attend in teams of two or four so that they can support one another when they return to their schools. Finally, the principal's commitment to, and involvement in, a changing vision of learning and instruction is considered critically important to the success of this program. Hence, principals are encouraged to attend selected portions of the program with their teachers. Furthermore, principals must agree to do the following:

- Release teachers from their regular classrooms to participate.
- Provide teachers with the authority and flexibility to adjust daily instructional schedules and to develop curriculum objectives that promote team teaching and interdisciplinary instruction.
- Allow time each day for teachers to meet and plan.
- Provide time for teachers to reflect on their practice.
- Acknowledge the importance of the team's efforts to the rest of the staff.

*The researchers observed at each site, interviewed the coordinators and examined their weekly reports, queried all participants via questionnaire, and collected extensive data (via interview, observation, and journal entries) from a selected group of Year One participants.*

## **Overview of Research Methodology**

The Year Two research agenda was designed to track participation, to document the evolution of the ACOT Teacher Development Centers at each site, and, especially, to describe the program's impact on teachers who participated during the project's first year. (For a fuller description of the program during Year One, see ACOT Report #18, "Creating an Alternative Context for Teacher Development: The ACOT Teacher Development Centers.")

To document the continuing evolution and refinement of the centers, the research team observed each site during practicums and summer leadership institutes, examined site coordinators' weekly reports, and periodically interviewed the coordinators. Researchers also obtained data from participants and coordinators via questionnaires.

To learn the ways in which the ACOT Teacher Development Centers influenced participants, we asked first-year participants to respond to a follow-up questionnaire toward the end of the second year of the project. The questionnaire asked teachers to comment on the success of the technology project they had planned while at the center, and to describe any changes they had made in their teaching that they could attribute to having attended a practicum and/or summer leadership institute.

Additionally, we conducted phone interviews with principals who had sent teachers to the ACOT Teacher Development Centers. Principals were asked to describe any changes they had noticed in participating teachers after they had attended the Teacher Development Center, as well as any impact on the school.

To investigate the impact of the project on participants in greater depth, we selected nine teachers who attended the first-year Summer Leadership Institute to serve as case studies. Three at each site were chosen, to represent a range of grade levels, teaching experience, and technological expertise. We further constrained the selection to ensure that their schools represent a range of contexts in terms of student socioeconomic status and amount of technology available.

Over the course of the 1993–94 academic year, information was gathered on the nine case study teachers through periodic classroom observations of their teaching, regular interviews, and audiotape journals in which they reflected on their use of technology, their ideas about teaching, and classroom and school events. Additional data were gathered about the case study teachers and their schools through interviews with other teachers and administrators at the school site.

## **Effects on Participating Teachers**

Teachers who attended either a practicum or summer institute reported an array of new attitudes and behaviors, including changes in beliefs about instruction as well as changes in instructional practices and uses of technology in their classrooms. In addition, participants took on a range of new leadership roles in their own schools and in their districts.

Analyses of the case study and questionnaire data suggest that instructional changes in classrooms occurred in three major areas: classroom organization, level of use of technology by both students and participants, and participants' philosophical beliefs and attitudes toward teaching.

*Participants reported that they were influenced by the various teaching strategies they observed, such as cooperative learning or interdisciplinary units, to begin using new strategies in their own classrooms.*

In addition to making changes in their classrooms, participants also took on new roles outside their classrooms. Many shared what they learned with colleagues. Others went a step further, and took on more formal leadership roles, influencing their school's climate and vision for the future. These new roles are described below, following the discussion of changes in classrooms.

### **Changes in Instructional Practices**

Participants in the Teacher Development Centers had opportunities to observe and reflect on a variety of teaching strategies, including direct instruction, team teaching, collaborative learning, project-based learning, and interdisciplinary learning, as well as ways in which technology can support different strategies. They report a variety of ways in which their instruction has been influenced by these experiences, including changes in classroom organization, in uses of technology, and, perhaps most powerfully, in their beliefs about instruction, their students, and themselves.

***Changes in Classroom Organization.*** Teachers report changes both in how they organize students for instruction and in the instructional strategies they utilize. Some teachers have begun using cooperative learning for the first time. Others have started implementing student projects. Still others are learning how to teach using interdisciplinary, thematic units. As one teacher stated,

*A way I have changed, and I credit that to ACOT, is I take the unit as a whole and try to involve them in the big picture more than just, "Let's read lesson so and so today and learn what's in that."*

Even teachers already using collaborative teaching sometimes altered their instructional techniques:

*What changed was what we do in those groups and how we present our lessons in those groups. We didn't necessarily do a unit and have students present it to each other before that.*

Participants report more use of the "station approach," in which groups of students rotate through a variety of different activities on a daily or weekly basis. Teachers find this strategy particularly useful when technology is limited. Although teachers report that planning for this approach is labor-intensive, they find that students respond well to this structure and that it ensures more equal access to the technology.

Often, as teachers acquire more technology, they increase the number of stations utilizing technology. One case study teacher, for example, after seeing what another participant had accomplished with a single computer station, decided to integrate technology stations into a unit on Japan. Over the course of the unit, students used a CD-ROM player, laserdisc player, and VCR, as well as a HyperCard® stack sent by a Japanese high school.

***Changes in Technology Use.*** Not surprisingly, questionnaire responses indicate that the major influence of the Teacher Development Center program has been on the nature and level of technology use in participants' classrooms. About 60 percent of

*Participants also reported using technology differently—reducing the use of drill-and-practice software, increasing the use of tools such as databases and spreadsheets, and introducing telecommunications into lessons. And participants also reported that these changes have led to higher levels of student motivation, interest, and engagement.*

the respondents said that the most important lesson or idea they had learned from the program was technology-related, including how to use specific hardware or software, or general ideas about the power of technology for instruction. Their examples illustrate the goals of the project—to integrate technology into instruction and use it to support learning goals, not as an end in itself.

Teachers who came into the program with some technological expertise began using technology for different purposes in their classrooms. Some, for example, reduced the use of drill-and-practice software in favor of more sophisticated tools such as databases and spreadsheets. Many report that, as a result of their own participation in the project, their students are “getting on the computer more” than ever before.

Even participants who were already using computers fairly extensively in their classrooms came back from the program with new skills and ideas. One case study teacher, for example, began new projects using telecommunications—a tool she had never used before. Students in her classroom began communicating with children in Japan and Nova Scotia, as well as with a professor of Shakespeare in New Mexico. Through the use of telecommunications, the case study teacher was also able to acquire shareware that fits into her social studies and language arts curriculum.

Novice technology users report returning to their classrooms with a greater level of comfort. As one participant commented,

*I was a nonuser of computers. Turning one on took major effort. Now I can use one well enough to use for classroom use, as well as help students do essays, etc. on them.*

Other novice users report that they are using their school’s computer lab differently. At one school, for example, a participant commented that she now goes with her students to the lab, rather than “sending them there and having them work with another adult.” Because of this new comfort level with computers, novice users with access to a lab are more apt to take the next step and begin integrating technology into instruction, rather than using the lab to “teach computers.”

In addition to gaining skills in using specific hardware and software, teachers also returned to their classrooms with more knowledge about the types of technology available. They were often inspired to purchase equipment for their own homes and classrooms. Some teachers spent personal funds to obtain new equipment, while others began their own fund-raising projects.

Teachers report that their changes in teaching strategies and use of technology have led to higher levels of student motivation, interest, and engagement. Students are writing more, reported a number of teachers, both on the computer and with paper and pencil. Peer relations have also improved in some classrooms. As one teacher reported, “Technology gets students turned on and it gets them pulling together and working as a team much more effectively than anything else.”

The effect on students in special education classrooms was particularly noteworthy, and sometimes surprised their teachers. In one classroom, the teacher found that her special education students were more willing to read in order to complete their projects than in traditional reading groups. A preschool teacher of children with special needs reported:

Describing the impact of the project on themselves, participants reported excitement as well as an increase in personal motivation and power. Many began to view themselves as learners again, and became more willing to take risks. They also gained new insight into students' capabilities.

*Technology has literally changed the flavor of my classroom. It's such a motivator for my special needs children, and I am getting oral language from children who were previously nonverbal. . . My kids just love it! They love being in control, they develop a sense of autonomy, competence, and soon begin relating with peers, giving them a sense of belonging.*

**Philosophical and Attitudinal Changes.** The most lasting impact of teachers' experiences in the Teacher Development Centers may prove to be changes in their attitudes toward teaching, their feelings of self-efficacy, and their beliefs about their students, which in turn influence their instructional practices.

Coordinators, principals, and teachers alike reported that participants commonly returned to their schools "all fired up." Along with the excitement came an increase in teacher motivation and morale. One case study teacher—a veteran of 25 years—said of the practicum: "It totally rejuvenated me. . . Now, I can't retire!"

Consistent with research conducted on the Teacher Development Center pilot project (Marsh & Sherwood, 1991), some teachers also reported an increase in feelings of self-efficacy and personal empowerment when they returned to their classrooms. One teacher stated, for example,

*I gained from the training a feeling of excitement and one of being capable. I gained a sense of accomplishment. A feeling that helped me try new and exciting ways to use technology.*

Many teachers also began to view themselves as learners again, and became more willing to take risks. Sometimes the risk involved trying a new lesson, or using a new piece of technology. But often the risk involved changes on a deeper, more philosophical level, such as a willingness to change the student/teacher relationship. One teacher, for example, said that the most important lesson she learned at the Center was:

*Being able to say, "I don't know, let's try it" to the students when they ask if something can be done. . . I don't always need an answer for every question a child asks. We can discover the answer together.*

Becoming a learner again also led some teachers to reflect on their teaching techniques and to question the value of what they were doing in their classrooms. "Putting the shoe on the other foot" gave teachers the opportunity to see the value of changing to a more constructivist teaching approach. One teacher reflected,

*I was a wonderful presenter. I was the one doing all of the work, and consequently, most of the learning. Sure, my students memorized the facts for the test. But I wonder now how many of them care about really learning anything. I find it hard, now, to believe that I expected all those kids to sit in a desk all day long and listen to me.*

Teachers not only viewed themselves differently after attending the program, but often saw their students in a new light. As they observed and worked with students at the center, participants realized that the children often knew more than they did about technology—and certainly learned new technology skills faster than

*Upon returning to their schools, many participants began sharing their new skills and ideas. They conducted workshops and presentations for colleagues or designed projects that involved the entire school in using technology.*

many adults. Teachers often returned to their classrooms with higher expectations for their students, as this quote from one coordinator illustrates:

*Before Mrs. Smith's study in ACOT, students used computers for drill and practice. They were not allowed to place software in the computers and always wrote on paper first and then typed their information using the computer. They never had the opportunity to print. Today, students compose on the computer and print their work.*

As teachers gained new insight into students' capabilities, they often began treating them with more genuine respect. As the principal of one case study teacher noted, "What has changed in her classroom is that the kids have more input and decision-making power."

### **New Roles for Teachers**

***Teachers as Staff Developers and Technology Trainers.*** Upon returning to their schools, many participants began sharing their new skills and ideas with colleagues. Teachers conducted mini-workshops and in-services, made presentations to faculty members and parents' groups, and held open houses where they demonstrated their new skills with the technology. Many teachers seemed anxious to "spread the word" to others, even when it meant working increasingly long hours before and after school. As one case study teacher stated, "I see my job as continuing to help other teachers and sharing with them what I've done."

Participants are sharing their expertise not only with other teachers, but also with students. At one school, a participant held after-school sessions for 15 weeks, training teachers and two students from every class on computer basics, curriculum integration, and different software programs. At another school, two teachers taught students in the gifted program how to use technology, including HyperStudio and camcorders, over a four-day period. The students then taught their peers in other classrooms. Based on the enthusiastic response to this project, the teachers were able to convince the principal to buy a site license for HyperStudio, which they are planning to integrate into the science curriculum.

Some teachers have designed projects that involve the entire school in learning technology. One teacher, for example, gathered all the computers that teachers weren't using and made a lab in the library. The entire school began funneling through the lab to work on keyboarding.

Another common way participants have found to share their expertise with other teachers and students is by creating "buddy projects." One case study teacher, for example, took computers into the library and paired the fourth-graders with the first-graders, and the second-graders with the third-graders.

Participants have also managed to get parents and other community members involved in using technology. One school media specialist decided to train parents to help in the library and in classrooms. At another school, participants organized a multimedia fair that was open to the community. This event was so well attended that participants are planning to have an even bigger fair next year.

Participants also created less formal strategies for sharing what they had learned at the Teacher Development Centers. These strategies were particularly

*Principals reported that participants took on leadership roles, for example, forming or joining a technology committee, advising on technology spending, and writing grant proposals to acquire more technology.*

useful for enticing reluctant teachers into the world of technology. Several case study teachers, for example, put up bulletin boards in the halls to show others how technology was used in their classrooms. They found that the bulletin boards “really seemed to get lots of teachers interested to see what we were doing.”

Another case study teacher took a “minimalist” approach to working with his colleagues. Rather than trying to impress them by demonstrating the most sophisticated uses of technology he had learned, he decided to “show exactly the lowest level of what you can do for yourself on the Macintosh.” By informally showing four or five teachers “the bare minimum facts” of how to set up the computer to produce a newsletter, he hooked teachers into learning more. He said,

*They realized a lot of it is very easy. I had more teachers come back to me and say, “Gosh, this was the first time we’ve ever had anybody sit down and slowly explain it to us.”*

Participants also found that “word of mouth” was an effective way of creating interest in technology use. For example, after inviting a few teachers into her classroom to observe a lesson using technology, one case study teacher found that others were coming in to watch and to borrow equipment. Principals who were interviewed during the second year of the project repeatedly commented that participants “got the ball rolling” toward change, and that teachers who had never expressed interest in technology before were beginning to “jump on the bandwagon.”

***Teachers as School Leaders and Entrepreneurs.*** Interviews with principals suggest that, upon returning to their schools, participants often took on leadership roles within their schools that ultimately affected the school’s climate and mission. After visiting the Teacher Development Center, teachers wanted more training and more technology for their classrooms, and used a variety of strategies to get what they wanted.

Some teachers joined or formed a school technology committee, and began to push their colleagues to create a shared vision for technology use throughout the school. In some cases, technology committees were instrumental in finding local organizations to help fund technology acquisition or in organizing fund-raising efforts. A number of participants were successful in convincing parent groups to earmark their funds for technology rather than for other purposes. Said one principal,

*There used to be a lot of resistance in the PTA toward computers. Now the attitude has changed.*

Principals also began looking to participants for assistance in making decisions related to technology purchasing and acquisition. When there was no money in the school’s existing budget to purchase technology or to offer staff development in technology use, participants persuaded principals to redirect funds that had been earmarked for other purposes. At one school, for example, the principal used funds from a program for gifted students to hire substitutes for the Teacher Development Center participants, who wanted time away from their regular classroom duties to teach the gifted students how to use technology. Other principals have used funding from state and federal programs in creative ways to buy equipment and to pay for

*Participants reported making presentations and helping to teach workshops, noting that the project has begun to have an impact on their communities and districts as well as on their schools.*

professional development. For example, one case study school received permission to use Chapter I monies to purchase technology.

A number of participants at each of the sites have become actively involved in writing grant proposals to acquire more technology and have been extremely successful in obtaining small grants from local foundations as well as larger district and state grants. At one site, for example, ACOT participants were involved in 10 of the 15 proposals winning district incentive grants and in 14 of the state-funded 21st Century grants.

According to principals at some of these schools, the grant proposals probably would not have been written if the Teacher Development Center participants “hadn’t insisted on it.” Participants agreed:

*My exposure to ACOT, along with several coworkers, led to major changes in our school’s technological future. We have gotten over \$200,000 worth of technology for our school in the past year through grants and PTA support. This has been a direct result of ACOT exposure.*

*We applied for and have received a \$50,000 grant to equip the classroom. Prior to attending the ACOT Teacher Development Center, I would never have dared to dream so big or know how to try to accomplish my dream!*

**Teachers as District Leaders.** In addition to having an impact on individual teachers and their schools, the program is also having an impact on the districts—and even the states—in which the centers are located. ACOT teachers and coordinators are being recognized for their expertise, and administrators at the school and district levels are seeking their advice. Coordinators have been asked to join a variety of technology committees at the state and district level. At several sites, coordinators also serve in an advisory capacity to local universities.

At one site, plans are under way to expand the teacher development center to include the entire school, so more teachers from the district can be trained. This type of recognition, however, did not happen overnight. The coordinator explained,

*We waited a long time for the ACOT project to be appreciated in our own school system, but it is now clear the project is recognized as a vital force in bringing about change.*

Graduates of the Teacher Development Centers are also becoming district and community leaders. At one site, participants are helping teach district in-service workshops offered on technology-related topics such as using district-licensed software. Two other participants were invited to teach a technology-related summer school class for preservice teachers at a local university. Some participants have moved into administrative positions. Others have been asked to make presentations to principals’ groups, potentially influencing many schools.

### **Influences on Participants’ Changing Practices**

The extent of changes in instruction and roles appears related to whether teachers attended the practicum or the summer institute, the nature of follow-up support they received, and conditions at their school. In particular, teachers were more likely to change instructional practices when they had attended both the practicum and

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the summer institute, and when they had follow-up support from the coordinator shortly thereafter. Similarly, instructional changes and sharing new knowledge with colleagues were more likely when the principal supported such change, when technical support was readily available, and when time was available for planning.

### **Differences Between the Practicum and Summer Institute Experience**

Teachers who visit the ACOT Teacher Development Center can attend a practicum, a summer institute, or both program components. During the first two years of the program, teachers first attended the practicum, and then up to one-half of these participants could come back for the summer institute with a team member from their school who had not yet been to the center. Although we have not examined the impact of each component separately, the consensus from participants and ACOT staff supports the value of having both experiences, with differences of opinion about preferred order.

The practicum and the summer institute offer different types of experiences for participants, both with distinct strengths and weaknesses. They differ in length (five days vs. four weeks) and in context (actual school-year classes vs. a voluntary summer program).

The shorter length of the practicum forces coordinators to weigh more carefully decisions related to the breadth and depth of information and experiences. Typically, coordinators choose to provide an introduction to a wide variety of topics rather than in-depth study on one or two software packages or teaching techniques. Consequently, the practicum offers participants “a little bit about a lot,” which some described as “a smorgasbord” or “a teaser” that “whetted their appetite.” For a few, such an overview was frustrating because they expected to learn specific technologies. For many, however, the practicum experience led participants to apply for the summer institute.

In contrast, participants in the summer institute not only had the luxury of exploring a wide variety of topics, but also had the time to engage in more in-depth learning. The additional time also allowed the coordinators to modify their plans from day to day.

The overriding strength of the practicum to participants is that it is situated in real ACOT classrooms during the school year. Class sizes are realistic, the curriculum is prescribed, and students are typically assessed by standardized achievement tests. Except for amount and variety of technology available, it represents the reality that all teachers face. The drawback is that, because it is “real” school, it offers less time for interaction between ACOT teachers and participants. The practicum allows participants to see the possibilities in a context that is similar to their own classrooms, making what they learned easier to transfer to their own situations. Because school is in session during the practicums, teachers can return immediately to their classrooms and try what they have learned while their excitement and motivation are high. However, having school in session means that many practicum participants return to their classrooms in the evenings to make sure their classes were running smoothly, adding to their workload.

In contrast, the summer institute offers “the best of all worlds.” Class sizes are small, there are no curriculum mandates, and there are no standardized tests for students or teachers to worry about. The summer institute gives teachers the

*Follow-up support from the coordinator, such as technical support and other kinds of assistance, was also a crucial factor in the change process.*

chance to work side by side with students and with ACOT teachers, to take risks, and to explore in a nonthreatening environment. In contrast, to participants in the practicums, summer institute participants feel much less time pressure. However, participants in the summer institutes must wait at least a month before trying their new ideas.

The coordinators believe that teachers who attend only the summer institute are more likely to make changes in their classrooms than those who attend only the practicum. Coordinators also report that summer institute participants tend to be much farther ahead than those who only attended the practicum, more likely to take on active leadership roles, and less likely to give up when they run into problems.

Many participants who attended a practicum and the summer institute felt that attending both program components was extremely valuable and that they complemented each other. One teacher stated, "I believe that for someone without the practicum, the summer institute would be overwhelming." Coordinators agreed that the practicum seemed to prepare teachers for the summer institute.

Although the program is currently structured so that participants go to a practicum before attending the summer institute, coordinators and project staff are open to considering either order. Indeed, teachers who had attended only the summer institute often asked coordinators if they could return for a practicum. However, such changes to the project's structure have not been attempted at this time.

### **Coordinator Follow-up Support**

An important component of the ACOT teacher development model is the recognition of the need for follow-up support for all participants. Information collected during Year Two indicates that coordinators offered a variety of types of follow-up support to participants and their schools, including the following:

- Technical support, including setting up equipment, troubleshooting, and advising teachers how to organize the classroom to increase student access as well as the mobility of the technology
- Suggestions for better integrating technology with instruction
- Feedback on teachers' specific projects that were planned at the Teacher Development Center
- Assistance with purchasing decisions, including providing teachers with software and hardware catalogs and information on technological equipment
- Assistance with grant-writing activities
- Suggestions on how teachers can continue to grow professionally, with information provided about specific resources available

Teachers were grateful for the encouragement, feedback, and new ideas given to them by the coordinators, as these quotes illustrate:

*The coordinator just gets you so excited because she's so excited that you've done your project. That just gets you that much more turned on. It's not just that you're doing it to please her, but it just gets you to want to do more.*

*She's looked at our ideas; she's discussed things with us; she's helped us see what additional things we might need and she's given us additional ideas.*

*While most participants welcomed support from the coordinators, some did not. The researchers found that the latter teachers were not as likely to implement change in their classrooms.*

In addition to helping individual participants, coordinators also served as advisors to the teachers' schools. Coordinators were often asked to make presentations to the school's technology committee, to parent groups, and sometimes even to the entire faculty. Commonly, coordinators held in-service trainings for other teachers at the school or helped the school develop a technology plan.

Coordinators agree that participants need follow-up support within one or two weeks after visiting the center. Coordinators have also discovered that two follow-up visits may not be sufficient for many participants. However, offering timely ongoing support has become increasingly challenging for the coordinators, especially with the addition of out-of-district teachers during the second year of the project. At times, coordinators felt overwhelmed, not only because of the time pressure, but also because they felt they were not meeting participants' needs.

Despite their best efforts, coordinators were not able to offer continual support to all participants. Although some teachers were quite resourceful in obtaining other means of support when coordinators were not available, we found that teachers were more likely to utilize what they had learned at the Teacher Development Center when they received timely and ongoing support from the coordinator.

Most participants welcomed follow-up support, but there were a few teachers who were reluctant to schedule visits from the coordinators, or even canceled visits at the last minute and never rescheduled. According to coordinators, some teachers felt "embarrassed" if they still hadn't set up their equipment and some feared coordinators might be "reporting to their principals." These teachers were not as likely to make progress toward implementing change in their classrooms.

Given the time constraints under which they were working, it is not surprising that coordinators focused more of their energy on giving support to those who openly sought help, rather than on those who were reluctant to ask for assistance. There were also large variations in the willingness of participants—and their principals—to ask for help. Compare, for example, these two quotes from one coordinator:

*The principal is always asking for additional visits to the school and has made several visits to ACOT with teachers and parents. My visits to this school are always different from my visits to other schools. The ACOT teachers have a way of planning my day so they can get the most out of me and my visit.*

*One school only allocates 30 minutes for my visits and has not allowed me to observe what is going on in the classrooms. The ACOT participants meet with me in a classroom and tell me what they are doing.*

### **Increasing Support Through Telecommunications and User Groups**

To increase participants' level of ongoing support, coordinators at each site have helped many participants set up telecommunications accounts through local universities so they can communicate with each other and with the Teacher Development Center. Ultimately, coordinators at each site would like to set up a bulletin board on America Online for Teacher Development Center "graduates."

For out-of-district participants—especially those in other states—telecommunications support may be the only type of ongoing connection they have with the Teacher Development Center. Unfortunately, some participants in rural schools find the cost of maintaining a telecommunications account prohibitive, while other

*The researchers found that instructional changes and sharing new knowledge with colleagues were more likely when the principal supported such change, when technical support was readily available, and when time was available for planning.*

participants find the interface of university-sponsored Internet accounts difficult to use. Consequently, although most participants have access to telecommunications support, not all use it.

Another strategy that coordinators have used to increase the support for participants was to create “user groups” that meet on a monthly basis. At two sites, participants meet together to share strategies and demonstrate what they are doing. Those who have attended these meetings find them useful and productive. Some participants also receive professional development credits from their districts for attending the meetings.

At the third site, the coordinator has worked with a local university to arrange for participants to share ideas at a seminar under the guidance of a professor in the School of Education. These teachers can also receive university credit for their participation.

### **Barriers to Implementing New Practices and New Roles**

When participating teachers return to their own schools and begin implementing their technology-based projects, as well as broader changes in their instructional practices, several factors affect their progress. These include access to technology, access to technical support, site leadership, and time.

Although all teachers had at least one computer in their classroom, those who were unable to change their instructional philosophy from what one principal described as “a certain mentality that says everyone needs to be doing the same thing at the same time” were frustrated by so little technology. In contrast, those who organized their classrooms with learning centers or stations found they could use one or two computers effectively. Of course, they, too, would prefer more technology.

Access to technology was an even greater barrier to those participants anxious to share what they learned. Participants found that other teachers were not as interested in learning about technology when access to technology seemed unlikely. One teacher, who was extremely successful in getting her colleagues interested in technology, noted the importance of a large technology grant to the school. “Without the grant,” she said, “the training would fall flat.”

Technical difficulties impeded some teachers’ ability to use what they had learned when they returned to their classrooms. Sometimes the problems were the result of participants’ lack of basic knowledge, while other times equipment simply malfunctioned. Although some participants were able to get help, teachers became discouraged when their plans were delayed because the technology would not work.

Teachers who *did* have basic troubleshooting skills found themselves in a different type of bind. Once word got around that a person knew how to troubleshoot, he or she was frequently called upon to fix other people’s equipment. According to one principal, a teacher at his school was “being treated as a repair person” until he told her to stop helping with troubleshooting.

Consistent with research on school change, the principal is a crucial factor in participants’ ability to implement changes in their classroom. Leadership and support for changing practice go well beyond the formal commitment required of principals to participate in the Teacher Development Center.

*Participants reported that the changes they had made in their teaching had a positive impact on their students.*

Principals do not have to be “technology gurus” themselves to provide support for their teachers, but they do have to show an interest in what their teachers are learning. Coordinators found that when principals attended part or all of the practicums with their teachers, the teachers felt a much greater level of support. Principals also took on leadership roles in acquiring new technology. Some principals reevaluated their school’s budget, and decided to buy new equipment instead of hiring personnel. One principal, for example, put phone lines in classrooms so teachers could use telecommunications despite the fact that his school is “poor as Job’s turkey.”

Perhaps the biggest barrier to teacher and school change that was reported by participants was a lack of time for planning, learning, and sharing ideas. Said one teacher,

*As far as anything new, it’s status quo. I haven’t had the time to develop any new programs; I haven’t had the time to explore anything. Nobody here told me to learn, explore, and play; they told me, “You do your job.”*

When principals provided flexibility in schedules so teachers could plan together and share their newfound expertise with other faculty, changes were more likely to persist.

## **Conclusions**

During 1993–94, 257 teachers participated in ACOT Teacher Development Center activities. Of those who participated in 1992–93, the majority indicate that attending the ACOT Teacher Development Center had a positive impact on their teaching. Teachers began questioning their traditional instructional approaches, and started to implement constructivist teaching strategies. Still others began to see themselves as learners, and felt a sense of excitement and rejuvenation. Novice users began to use technology more frequently in their classrooms. More-experienced users reduced their reliance on drill-and-practice programs and began using more sophisticated tool software.

In many cases, teachers reported that the changes they had instituted had a positive impact on their students, including increased engagement and motivation and improvements in students’ ability to work together.

The ACOT Teacher Development Center also had an impact on participants’ schools. Participants offered technology training to peers, administrators, parents and students, often leading to an increase in technology use throughout the school. Participants became leaders in their schools by creating school technology committees, by making formal presentations to parent groups and administrators, and by persuading principals to acquire more technology. And they played an instrumental role in writing successful grant proposals aimed at increasing the level of their school’s technology.

Not all participants returned to their schools and made changes. Teachers who had access to appropriate hardware and software were more likely to integrate technology into their instruction than those who did not have access. Teachers who had time to explore, to continue to learn new skills, and to plan lessons were more likely to change than those who did not. And teachers who had someone to turn to when

*In addition to influencing individual participants and their schools, the ACOT Teacher Development Center project has also had an impact on the schools in which they are located, and even on the districts themselves.*

technology did not work were more likely to continue to risk new approaches than those who did not have technical support.

Many teachers were given ongoing follow-up support by program coordinators, who offered technical support, instructional advice, and feedback on specific projects, as well as suggestions on how teachers could continue to grow professionally. Although the coordinators were able to help many teachers overcome the barriers they faced, their support alone was unlikely to sustain teacher change in the absence of support from their principal.

### **Next Steps**

In addition to influencing individual participants and their own schools, the ACOT Teacher Development Center project has also had an impact on the schools in which they are located, and even on the districts themselves. One site has already begun adding ACOT classrooms so that more teachers from throughout the district can be trained. There are also plans at this site to create another Teacher Development Center at a middle school using district resources. At another site, the school has recently committed to becoming the district's technology magnet school, and will be expanded to become the teacher development center for the entire district. Finally, at the third site, the district has decided to open an alternative school to which the ACOT Teacher Development Center will be relocated.

The research for the third and final year of this grant will examine the project's effects on the schools and districts in which the centers are located. Case studies of schools in each site that are viewed as having the strongest potential to become second-generation ACOT Teacher Development Centers in each district will be conducted. We will also continue to document the evolution of the ACOT Teacher Development Center model, and its impact on participants, including comparisons between groups who attended the practicum, the summer institute, or both.

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### Apple Computer, Inc.

1 Infinite Loop  
Cupertino, CA 95014  
(408) 996-1010

### APPLE CLASSROOMS OF TOMORROW

Phone: (408) 862-5134  
Fax: (408) 862-6430  
E-mail: [acot@apple.com](mailto:acot@apple.com)

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