



APPLE CLASSROOMS OF TOMORROW

**Teacher Beliefs and Practices
Part II: Support for Change**

**The Evolution of Teachers'
Instructional Beliefs and
Practices in
High-Access-to-Technology
Classrooms
First-Fourth Year Findings**

Authors

David C. Dwyer, Ph.D.
Cathy Ringstaff, Ph.D.
Judith Haymore
Sandholtz, Ph.D.
Apple Computer, Inc.

ACOT Report #9

Research

Apple Classrooms of Tomorrow (ACOT)SM 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 online 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.

Acknowledgments

Summarized and designed by Linda Knapp.

Contributions and support from Gina Funaro, Jacqui Giddings, Wayne Grant, Linda Knapp, Connie Troy-Downing, Loree Vitale, and Keith Yocam of the ACOT staff. Many thanks to the dozens of ACOT teachers who are on the line every day, facing full classes, district mandates, and traditional measures. They still manage to discover, grow, laugh, and find the time to share their experiences with us.

Part I of this research describes five phases ACOT teachers go through as they replace traditional beliefs and practices with new ones that support more active and engaging learning experiences for students.

This report, Part II, examines the personal development of two ACOT teachers as they experience this process of change. The different outcomes of the two teachers illustrate the critical need for appropriate support at each phase of development.

This four-year study examines ACOT teachers at five public school sites from 1986–89. The schools reflect the nation's diverse populations and conditions; the ACOT classrooms within these schools provide teachers and students with immediate access to interactive technologies.

Introduction

The Apple Classrooms of Tomorrow (ACOT) research project has been gathering data since 1986 on what happens when teachers and students have constant access to technology. Analysis of the collective data has clarified a number of hunches about how teaching and learning change in these innovative environments, what factors inhibit change, and what support is needed to promote and sustain fundamental changes in education.

Part I of this research summarizes the developmental phases ACOT teachers go through as they gradually replace their traditional beliefs and practices with new ones (see ACOT Report #8). The report represents the teachers' development as five phases: Entry, Adoption, Adaptation, Appropriation, and Invention. In this model, the teachers' traditional text-based curriculum is delivered in a lecture-recitation-seatwork mode is first strengthened through the use of technology and then gradually replaced by far more dynamic learning experiences for students.

The current report, Part II, puts a magnifying glass to the five-phase model and examines the individual development of two ACOT teachers. These personal examples illustrate the conflict and vacillation ACOT teachers experience when teaching and learning begin to change in their high-access-to-technology classrooms. The critically different outcomes of the two teachers' experiences demonstrate the need for support from both colleagues and administrators that is appropriate at each of the five phases.

Research shows that instructional change is not a matter of abandoning beliefs, but of gradually replacing them with more relevant beliefs developed through experiences in a supportive environment (e.g., Nespor, 1987). If there is no change in the larger system, the struggling teacher and the innovation are doomed to frustration or abandonment (Bowers, 1973; Schiffer, 1979). The current research demonstrates that implementation of significant change efforts must take into account the need to recognize teachers' belief systems and to design appropriate support.

The Study

Overview

This study focuses on ACOT teachers at five sites over a four-year period, from 1986–89. Each of the sites began with one grade level in the fall of 1986, adding classrooms, staff, and students in subsequent years. By 1989 the study included 32 teachers and 650 students in four elementary and one high school whose demographics range from inner-city to rural, and low to high socioeconomic status. Together the schools represent the diverse populations and conditions currently found in the nation's public schools.

ACOT classrooms in each of these settings offer teachers and students constant access to interactive technologies, including Apple®II and Macintosh® computers, printers, scanners, laserdisc players, modems, and hundreds of software titles.

This study draws from the ACOT teachers' bi-weekly personal journals. In these audiotaped accounts, teachers talk about their observations and reflections concerning daily classroom experiences. Their remarks are then sorted, recorded, and indexed as episodes in a database that has accumulated 7,976 episodes.

Changing teachers' deeply-rooted instructional beliefs and practices is not simple. In ACOT, the direction of change is towards child-centered rather than curriculum-centered instruction; collaborative rather than individual tasks; active rather than passive learning. Each of these dimensions conflicts with the teachers' traditional beliefs about schooling.

Though teachers have different experiences, there are similarities in the ways they deal with and overcome these conflicts. The significant difference lies in the kinds of support provided by colleagues and administrators. The two teachers chronicled here highlight the need for such support.

The technology is used as a tool to support learning across the curriculum. By design, the classrooms are true multimedia environments where students and teachers use textbooks, workbooks, manipulative math materials, white boards, crayons, glue, overhead projectors, televisions, musical instruments, etc., as well as computers. The operating principle is to use the media that best supports the learning goal.

Data Collection and Analysis

Part II of this study draws from the ACOT teachers' personal journals. In these journals teachers record their observations of events in their classrooms and their reflections on those events on audiotape, producing an average of two 60-minute tapes per month. The tapes are mailed to Apple where they are transcribed and entered into a database. Instructions about content on the tapes are purposefully left vague, leaving teachers free to report what is most salient at the time to each of them.

Teacher audiotapes are monitored by graduate students who digest the source information into discrete "episodes," and index them according to content. The resulting four-year database contains 7,976 audiotape episodes. The indexing system allows sorting and rapid retrieval of descriptive, qualitative data along a number of dimensions for the construction of narrative reports about the project. Through indexing, sorting, and comparing episodes, important themes and events emerge.

The Findings

The process of changing one's inner-most beliefs about teaching and learning and consequently, one's routine behavior and intuition, is not simple. As one ACOT teacher recorded in her audiotape journal:

I guess I have to realize that what I am doing is learning how to undo my thinking.

The process is ridden with self-doubt, subject to external influence, exhausting, and never unidirectional.

Upon entering the ACOT program back in 1986, most teachers anticipated that technology would make their jobs easier and more efficient. Most never dreamed they would alter their instructional approaches or broaden their perspectives about what children should and should not, could and could not accomplish in their classrooms. One teacher reported:

You start questioning everything you have done in the past, and wonder how you can adapt it to the computer. Then, you start questioning the whole concept of what you originally did.

This kind of questioning led to experimentation, and successful experiments led to more experiments. Failures led to setbacks, even temporary cessation of new strategies. But fundamental alterations in these classrooms—the intensity of student engagement, the extent of collaboration, the presence of the technology as a symbol of change—had their own sort of momentum. Inexorably, teachers seemed drawn into further exploration, while students collectively influenced events as they always do, expressing pleasure and displeasure clearly and persistently.

Fifth-grade teacher, Mrs. Smith, fought a continuous internal battle between her need for a quiet, orderly classroom and her desire to foster the more dynamic learning experiences that emerged in her high-tech classroom.

The result was vacillation: at one point she would encourage collaborative learning and innovative projects, but then she would become frustrated with the commotion and switch back to a lecture and seatwork mode.

Without a supportive working environment, Mrs. Smith could not resolve her inner conflict and ultimately left the project.

The direction of change was towards child-centered rather than curriculum-centered instruction; towards collaborative rather than individual tasks; towards active rather than passive learning. Each of these dimensions brought deeply held beliefs about traditional schooling into conflict with what teachers witnessed in their classrooms. The conflict never transformed those beliefs outright; the process seemed more gradual: an erosion of the old, an accretion of the new. During this process, teachers' actions would first swing one direction and then the other.

Each teacher's experience with confronting his or her own beliefs and gradually revising them is unique, yet there are similarities in the way they deal with their dilemmas and how they manage, or do not manage to overcome them. In the following two teacher examples (derived from their bi-weekly audiotape journals), the significant difference lies in the kinds of support provided by their personal and institutional contexts.

Mrs. Smith: Fifth Grade

Mrs. Smith is a fifth-grade teacher in an inner-city elementary school. Early in her first year as an ACOT teacher she noticed increased student engagement when children had more choice and when lessons were less teacher directed. She was anxious, however, because student engagement was tightly coupled with computer use and student collaboration, which increased movement and noise. Movement and noise conflicted with her belief in classrooms as quiet and orderly places. The result is a story of vacillation.

At the beginning of the year, Mrs. Smith established a traditional routine that involved presenting a lesson followed by students doing practice drills on the computer. Then, she allowed them to use their computers during the lesson and reported that this improved attention and involvement.

From this small success came several experiments. Mrs. Smith established a free period for children to work on software of their choice. She began small group instruction enabling students to work more on their own, and she also initiated a newspaper project that allowed students to choose the editorial staff and essentially run the activity.

At first she was pleased with the students' involvement, but by early December she expressed concern about covering the mandatory curriculum objectives.

I would feel a lot more comfortable about some of the things that I do if I just knew that before the end of the year I really was going to be able to meet all the objectives and all the things that these children will need.

Consequently, she cut out the free choice period, reporting there was not enough time for that type of learning activity, adding that it was noisy and created too much excitement.

However, other activities, such as the newspaper, fared better because she saw positive outcomes that included responsibility, skill development, and peer tutoring. In fact, by mid December it was common to see children working together on projects in her room. Reflecting on the status of her classroom, Mrs. Smith noted:

Old teaching friends were swapping “horror stories” about this year’s problems, but the ACOT room has none to offer. A parent also reported stories of problems in another school’s fifth grade. Not everyone in the ACOT classroom is perfect, but I do not have the discipline problems that I have had in the past or that my friends are having this year. And I think the factor that I would say made the difference is the computer. Students are getting positive feedback, immediate feedback; they’re busy; the work is more appropriate because they have varied activities. I have more time to deal with problems.

From this report one might assume smooth and continuous progress in the new instructional direction. But immediately after the winter break, Mrs. Smith made an abrupt about face. Her tapes reported discipline problems and a need to control the class. She even questioned the value of students working together. Yet, less than a week later, Mrs. Smith reported on a particularly satisfying science class, where again, children were working together, actively and independently involved in the lesson.

Over and over again, the student involvement that she desired was pitted against the noise and movement that she could not accept, and these became dominant themes in Mrs. Smith’s thoughts. At one point she reflected:

Lots of noise results from the interaction of computer activities: children talk, move around more than in conventional classrooms. Keeping noise and movement controlled is necessary.

The availability of software at individual workstations gives students too much control over what they elect to do. Some students choose to do things that are not relevant at the time. The software can be very tempting.

Once again she returned to whole group lecture and recitation activities. But with this return to traditional schooling came a period of insurrection met firmly with an assertive discipline program. She reported, “Misconduct is a real problem. I’ve been working very hard on a new discipline program. Consequently the children have been very unhappy.”

In late January, Mrs. Smith again questioned her direction. Things were not going well. Again, she was drawn to think about students working together with more responsibility and began to open up her class once more.

Last year the children were not allowed to speak without raising their hands, and had to ask permission to leave their desks. But now, the students are interacting with each other about their software. They are helping each other. I need this kind of cooperation.

Although Mrs. Smith felt a need to revise her beliefs concerning discipline, she still had trouble tolerating children leaving their seats. At the same time, her journal chronicled larger and more ambitious task designs for her students. She created opportunities for them to work together for extended periods of time and offered an increased choice of tools.

High school math teacher, Mrs. Brown, also experienced inner conflict as she experimented with new instructional approaches. She wondered if student groups were wasting time, if she was losing authority, and if the students could actually learn math without her lectures.

Gradually, with support from colleagues implementing similar approaches, and with support from administrators, Mrs. Brown successfully developed more effective learning experiences for her students and more relevant beliefs to guide further professional growth.

As the end of the year approached, Mrs. Smith's problem with noise and movement gradually lessened, but was not completely resolved that year, and after that she left the project.

Mrs. Brown: Ninth- and Tenth-Grade Math

Mrs. Brown is a high school math teacher who joined ACOT in its second year. She found success with an individualized, student-centered approach to instruction despite a long-held belief in the teacher as the source of knowledge.

Early in her first year with the project, Mrs. Brown observed an experienced ACOT teacher's classroom and commented on a significant difference from her own traditional approach, "[I] saw that I really have 30 teachers in my class and I should use them."

Despite recognition of her students' skills, she worried for months about her lack of computer expertise and what students would think of her. It was hard to abandon the image of herself as the authority in her classroom.

I'm uneasy about the kids' response to me when I'm working with the computers and don't really know what I'm doing. . . . You wonder what the kids will think if they know more than you do. The students have never held their knowledge as a threat, and they are great at helping me. It's something in myself that I'm uncomfortable with in this situation.

Mrs. Brown implemented what she knew best: a lecture-oriented program where new topics were presented, students took assignments home, and returned the next day to have their work checked. But she was unhappy with the results. She noted, "The kids are bored. They're doing their homework from other subjects when I am teaching."

In mid December, Mrs. Brown presented an alternative to math lecture and recitation. The change brought an immediate response from her students and opened Mrs. Brown to new ways of thinking about instruction.

When I started showing the kids how to assemble their string art projects, I expected to have to explain it to each individual kid. What happened was that I explained it to one kid and then the rest got together and figured it out together. They're so used to working with each other that they don't hesitate to figure out assignments together. I've never seen this happen before—it was great to watch them work together.

Returning from winter break, Mrs. Brown continued to work more with small groups. Although she was generally pleased with students' progress, she had a difficult time shaking the feeling that she wasn't really teaching. The word "guilty" enters the record for the first, but not the last, time.

I'm concerned about what's happening in Algebra and Geometry, so I guess I'll use the tape as a sounding board. When I try to be objective about it, I feel like I'm spending less time up there teaching. We now have disks for some lessons, which I refer the students to. I know they're learning very well with the computer. . . . I feel a little guilty, it's a strange sensation.

Fewer lectures and more small group assignments brought her closer to her students. The fact that she was closer to the action began to change her perspective on what happened when children put their heads together.

I feel like I'm focusing more on the students now. . . . It's exciting to see them all helping each other. It's so natural for them to just lean over and check what they're doing with each other. The computers have forced a socialization that I'm sure the students aren't even aware of.

Then, Mrs. Brown received a jolt from a substitute teacher that placed new and old beliefs in conflict, once again. She reported, "He commented that the classroom atmosphere was much too loose. . . .the substitute made me wonder if we really were too non-traditional."

The sting of the criticism lasted for weeks and appeared in her account as fear, doubt, and once again, guilt. But even in those expressions, another part of her argued for the collaborative, student-centered vision of teaching. In one report, "I feel guilty when I let the students work in groups for fear they will just play around. But they did a real good job today with their HyperCard® stacks."

By the end of her first year in the project, Mrs. Brown had worked steadily at changing her instructional behavior, but nagging doubts persisted to the end.

One thing I have had a hard time with as a traditional classroom teacher is to let them go, let the students try a new way. I find myself falling back into the old way because it's easier and saves me time. Yet I'm not satisfied with lecturing to the students, and I really look forward to planning ways to take advantage of the alternative teaching styles available to me.

In the second year, Mrs. Brown's struggle with old beliefs and new practices continued, but gradually new beliefs, supported by successful experience and team support strengthened and increasingly replaced the traditional beliefs. She reflected:

I think about the way I taught in the old days, three years ago. Lecture, summarize, give examples, and assign homework. In each class the students only worked on problems at home and then came back with questions, which I would ask for at the beginning of the period. I dreaded the routine. I loved test days when I didn't have to do anything. I think about how differently I do things now, with ACOT and the individualized program. I could not go back to the old way. I will always keep this individualization with me, even if I went back to a regular class room. Many kids can learn on their own, and many can take responsibility for instruction. I am seeing their capabilities as I have never seen them before.

Later in the second year, Mrs. Brown began fine tuning her approach. She looked for ways to combine the best that she had known from her traditional days with her new goals. Overall, she reported success after success.

The week is over and I feel good about all that is going on. I am not threatened any longer that what I am doing in class is a waste of time. I was weary of the problems of teaching new applications. But I see what the kids are getting out of it now, how the thinking process works, and that they are not being short changed at all. They really are learning.

It is so exciting to see that these kids can learn from each other, that they don't have to have a teacher standing over them at all times. I'm overwhelmed, but on the other hand, they're learning without my help, and it's a little of a shock to get over.

Still, the old patterns continue to emerge again and again, even after continued success with the application of new behaviors. Their appearance surprises even the perpetrator. The following is taken from Mrs. Brown's third-year journal.

I lectured and summarized and felt like I was talking to a wall. It's interesting how I go back to a straight lecture situation, after the kids have been involved in so many group activities and getting their brain cells to work during class, and all of a sudden they just sit there like vegetables. It's yucky to see them sitting there looking at me.

Mrs. Smith and Mrs. Brown both vacillated between the traditional approaches to instruction that were familiar, and new approaches that seemed more appropriate in their high-tech classrooms. The critical difference between their experiences was the working environments in which they tried to change.

In a conventional setting, without opportunities to work with other teachers and with criticism from colleagues and administrators, Mrs. Smith could not overcome the obstacles.

Conclusion

These cases show two teachers in very different settings vacillating between traditional approaches to instruction that they practiced for years and new patterns of instruction that seemed somehow more appropriate in their technology altered classrooms.

Mrs. Smith experienced pedagogical swings that were the result of an inner conflict between how she believed classrooms should function and how she experienced instruction in a radically altered classroom where students had computers on their desks. A cycle was created in which she initiated innovations that led to outcomes that raised her anxiety. She reduced the anxiety by returning to familiar approaches, but then encountered resistance from her students, who preferred the more innovative activities to the traditional ones. Then she would again attempt a more innovative path until her anxiety level rose once more. The process was exhausting for Mrs. Smith and contributed to her retirement from the ACOT project after her first year.

Mrs. Brown followed a similar path, full of switchbacks, between a tradition-bound, lecture-based curriculum and an individualized approach that benefited from spontaneous student collaboration. Her feelings and instructional behaviors pivoted as she tried to resolve the dissonance between her conservative beliefs about schooling and her experiences with students in the computer-filled classroom. Although the process was equally challenging and exhausting, Mrs. Brown did not leave the project. In fact, she has returned year after year with increasing pedagogical strength and certainty about her direction.

Why, then, did one teacher drop the innovative program in frustration and the other stay with it until she experienced success in her efforts?

In an environment that was already committed to joint planning, team teaching, and interdisciplinary instruction, Mrs. Brown had daily opportunities to work with colleagues and received encouragement from teachers and administrators. As a result, she flourished, despite periodic setbacks.

When teachers attempt to implement fundamental changes in education, they must also revise their deeply-held, traditional beliefs about schooling. The change process is difficult, requiring ongoing support from colleagues and administrators that is appropriate at each phase. Technical training is vital in the beginning. Later, teachers need more opportunities to examine and discuss their actions and underlying beliefs, and freedom to explore new approaches and curriculums.

There was a significant difference in the working environments in which these two women strove to change. Mrs. Smith taught in a traditionally organized elementary school—a self-contained classroom with little to no opportunity to watch other teachers or even discuss what she was attempting to do. In fact, she believed that colleagues and administrators, even her family, were critical of her efforts. Mrs. Brown, however, entered the project in its second year. The first-year staff had established a firm commitment to joint planning, team teaching, and interdisciplinary instruction. In this setting, Mrs. Brown had constant opportunity to watch other teachers in action and talk with them informally throughout the day. Both her principal and the district technology coordinator routinely praised the program and its directions. In the first setting, Mrs. Smith succumbed to the shear weight of her effort; in the second, Mrs. Brown flourished, despite periodic setbacks.

From the experiences of teachers such as these, the research team has identified overall patterns of change (see Part I) as well as a support system that fosters long-term change in innovative classrooms.

Implications for the Future: Support for Change

Research findings and reflections on ACOT's experiences indicate that teachers go through several stages of development when attempting to implement fundamental changes in education. As they progress through these stages, gradually replacing traditional beliefs and practices with new ones, it is critical that their working environments be supportive. Colleagues as well as school and district administrators must provide ongoing support for long-term change to be successful. Further, recognizing that change is evolutionary, the research team suggests an incremental approach to physical alterations of the environment and a progressive shift in the type of support for teachers passing through the last three development phases: Adoption, Adaptation, and Appropriation.

When integrating computer technology into K–12 classrooms with instructional change as the goal, the recommendations listed on page 15 will help speed and ease the transformation. In the early stages of implementation, teachers' needs center around their concerns with the hardware and software itself. Technical training is a key ingredient to successful adoption. But as the development proceeds, teachers need more opportunities to confront their actions and examine their motives; to bring their beliefs to the surface; and to critically reflect on the consequences of their choices, decisions, and actions. They need opportunities for ongoing dialogue about their experiences and for continuous development of their abilities to imagine and discover more powerful learning experiences for students.

Bringing significant change to the way we do schooling is a complex proposition fraught with setbacks. The experience of the ACOT project demonstrates the value of taking a long-term perspective on change and making the necessary personal and organizational commitments to bring about that change. Teachers bold enough to participate in these efforts require and deserve modifications in their organizations' structure: alterations that permit and encourage peer observation, dialogue, and reflection. Most importantly, they must have continued assurance that their struggles are worthwhile. To the observer, hoping for quick evidence of the efficacy of innovations, computers or otherwise, the process can only be frustrating and inconclusive. To those dedicated enough to make the commitment, the process can be very rewarding.

Bibliography

Bowers, D.G. (1973) OD techniques and their results in 23 organizations: The Michigan ICL study. *Journal of Applied Behavioral Science*, 9, 21–41.

Nespor, J. (1987). The role of beliefs in the practice of teaching. *Journal of Curriculum Studies*, 19(4), 317–328.

Schiffer, J. (1979). A framework for staff development. In A. Lieberman & L. Miller (Eds.), *Staff development: New demands, new realities, new perspectives*, (pp. 4–23). New York: Teachers College, Columbia University.

APPLE CLASSROOMS OF TOMORROW

Apple Computer, Inc.

1 Infinite Loop

Cupertino, CA 95014

Phone: 408-862-5134

Fax: 408-862-6430

acot@applelink.apple.com

L01561A