THE SPARTANBURG INTERACTIVE CABLE EXPERIMENTS IN HOME EDUCATION

PREPARED FOR THE NATIONAL SCIENCE FOUNDATION

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PREFACE

In January 1974, the National Science Foundation announced a two-stage competition for the design and implementation of experiments in the public service uses of interactive cable systems. Rand, in cooperation with TeleCable Corporation and South Carolina public service agencies, submitted one of the seven successful proposals for planning grants provided in July 1974 by NSF's Research Applied to National Needs (RANN) program. After the results of the seven planning grants were reviewed, contracts were made with three groups: (1) New York University for work with senior citizens in Reading, Pennsylvania; (2) Michigan State University for a program for training firemen in Rockford, Illinois; and (3) Rand and TeleCable for the Spartanburg, South Carolina project, home education experiments in the fields of adult and parent education. An experiment not reported here involved the use of two-way video communications for the in-service training of the staff of daycare centers. Its results are presented in Sue E. Berryman, Tora K. Bikson, and Judith S. Bazemore, *Cable, Two-Way Video, and Educational Programming: The Case of Daycare*, R-2270-NSF, October 1978.

This report seeks to inform citizens and public officials who are interested in the use of telecommunications for the delivery of educational programming. It also serves as a detailed report of the methods and findings used in the home education experiments for those concerned with the value of alternative forms of the return link in two-way communications.

The reader need have no technical training in cable engineering or telecommunications. The concern here is with the *use* of the technology, not the technology itself.

SUMMARY

Interactive cable technology can potentially provide adult and continuing education outside conventional institutions. One set of experiments on the interactive cable system located in Spartanburg, South Carolina, was aimed at adults who have not completed their high school education; the other was aimed at parents interested in the principles of child development. These experiments attempted to determine (1) whether sufficient numbers of students will be attracted to and enroll in courses that rely on home terminals, allowing students to respond interactively to educational programs; and (2) if these students can use the system to make satisfactory educational progress. In other words, does interactive cable technology provide a means of reaching educational markets with effective programs beyond the classroom?

The experiments were further designed to illuminate the continuing debate over the federal government's role in supporting and regulating interactive cable service. The following options were considered: (1) regulation—requiring construction of technical capacity for interactive cable communications; (2) deregulation—strengthening the cable industry by encouraging pay cable and growth of new services; and (3) subsidy—supporting the costs of new services, especially for the physically and socially disadvantaged where the economic viability of such services is in doubt.

The Spartanburg project used live instructional programming as its interactive mode of educational technology for the adult and continuing education programs. The teachers taught much as they would in their conventional classrooms, mixing lectures, exercises, and live responses to students' questions. Students occasionally had an opportunity to speak with the teacher, but their primary mode of interaction was through the use of simple data terminals. Although the cable students could not ask questions spontaneously or make comments, they could send prearranged signals indicating confusion, boredom, or a desire to ask questions. The teacher could respond at that moment, calling students by name if circumstances warranted. In short, it was an "electronic classroom."

In its approach to interactive instruction for the educationally disadvantaged, Rand carried out a series of quasi-experiments to demonstrate the use of two-way interactive cable television as an alternative to traditional adult education in the classroom and to test the relative effectiveness of the two forms of instruction. Courses in mathematics, reading, and language skills were offered through Spartanburg Technical College (TEC) to adult students to prepare them for the S.C. General Education Development (GED) examinations. Instruction was provided to two groups: conventional classes at Spartanburg Technical College and cable classes of students with interactive terminals who received the instruction over a closed cable television channel in their homes. Four adult education experiments included three rounds of high school equivalency education and one basic adult education course to prepare students to enter a high school course.

Classroom interaction processes as well as educational effectiveness were assessed, and the findings were positive in both domains. Although striking similarities and differences were found between the instructional processes in cable and

conventional classes, the experimental series apparently allowed the teachers to improve their use of both environments. In addition, the effectiveness of interactive cable television as an instructional medium for (at least) GED-level education was documented: Cable students fared no worse for missing the social environment of a conventional classroom, and for some of these students home cable classes provided their only means of finishing high school. The only disappointment was the small turnout for cable classes (an average of just over ten students).

A second series of experiments considered the potential commercial market for interactive education programs in a context of widespread telephone availability. Parent education was selected as the content. The design sought to isolate the marginal utility of data terminals above the use of the telephone. The two experiments were designed to test the relative benefits of two conditions of instruction—low-level data interaction combined with telephone return, and only telephone return, when either mode is used to complement program delivery. The programs contained a framework for application of Piagetian principles for parents interested in child development. These programs were intended to convey three types of knowledge about developmental sequences in childhood: (1) a general knowledge of developmental stages, (2) specific knowledge of the characteristics of the stages, and (3) knowledge of means by which principles of development can best be applied. Although the two experimental groups exhibited no differences in knowledge acquisition, there were significant gains in knowledge in both conditions over time. We conclude that data return, at least when minimally used, adds little to the learning process that is directly observable in knowledge gains. It is possible, however, that polling terminals have marginal value for learning if they are used more frequently during class or used by different types of students.

In light of the nature and size of the markets found in Spartanburg, subsidies and detailed regulations to establish such systems do not seem warranted. The most promising avenue appears to be the growth of commercial interactive cable systems. The evolution of advanced cable systems would be served by removal of federal regulatory barriers. The recent and continuing removal of restraints on the growth of the cable industry may well be sufficient to allow home cable education to prosper. More aggressive steps can be left to the future, but it seems appropriate now to watch the market forces at work to see if they are sufficient to bring interactive education into the home.

ACKNOWLEDGMENTS

Public officials and private citizens from all walks of life contributed immeasurably to this research, and it would require many pages to list their contributions. Geraldine Nantz, Bob Stephens, and John Tillotson showed an interest and an innovative spirit that led to the initial selection of Spartanburg as a site. Tom Barnes, Betty Carnes, James Thompson, and Joe Gault supported the involvement of their staff in the development of ideas that became the programs reported on here. But of the many who helped us, the greatest debt is to those who lent us their time and their enthusiasm in the pursuit of ideas that could not be brought to implementation. Nancy Carter, Charles Bevis, and the staff of the Spartanburg Mental Health Clinic, N. F. Walker and others at the South Carolina School for the Deaf and Blind; Wiley Cooper of the United Way of Spartanburg; Joanne LeGette, Linda Liverman, and many others in the South Carolina Department of Social Services; and Walter Hennis of the State Employment Department and the Spartanburg staff of the Work Incentive program assisted us in creating and developing program concepts that could not be funded. Not being able to meet the expectations and hopes that the project staff created is our greatest regret.

The all-important cable plant, the foundation of the experiments, was there because of the vision of The TeleCable Corporation. Gordon Herring assisted in every step of this activity, from the uncertain days of deciding to form the consortium, to the trials and tribulations of putting it into operation. The project would not have existed without his thoughtful assistance. Key elements of the system design were ably assisted by Nick Worth of TeleCable and Harold Katz of Interactive Systems, Inc. The TeleCable managers of the Spartanburg system, first Victor Nicholls and then Richard Fairbanks, put up with the day-to-day problems of the project and showed patience and goodwill when the task of running a cable system sometimes came into conflict with supporting an experiment. And if one individual should receive credit for making it all work, it is Johnnie Turner of TeleCable who as chief technician ably directed the technicians who put it together, and always managed to be there to fix it on those occasions when we turned it on in the morning and nothing worked.

The adult education courses were first conceived of by Jocelle Heatherly of Spartanburg Technical College, and her enthusiasm carried us all through the rough spots. Tina Bailey, Sandra Boyter, and Vicki Dill taught the courses and opened themselves to scrutiny in ways few teachers would accept. In so doing, they provided a model for the future of home interactive teaching. Barbara Hughes of TEC assisted us in the frustrating task of running down other service ideas in the planning period. Sally Abrams and Mary Belcher provided assistance on course materials, administrative support, and moral encouragement when it was sorely needed.

Within Rand, John Carter shared the many long days in the planning period, helping select the programs. Sue Berryman must be singled out as having provided an important touch of quality to the research, and many of her ideas that appear in the companion volume on day care centers were carried over into the research on parent education. She directed much of the work on the measures used in those

experiments. Tora Kay Bikson contributed substantially to the early formulation of those ideas, and Suzanne Quick offered valuable counsel in the field research effort. Lynda Glover served as administrative assistant, field research supervisor, and cable instructor; she performed the many small tasks essential to the project's success. Jack Ensor, Yogi Ianiero, and Robert Yoder made Rand's administrative structure respond to the varied requirements of the project. Throughout it all, Barbara Williams, Director of the Washington Domestic Program Center, gave the project her support and counsel when they were most needed.

This report finally benefited from the careful criticism of Polly Carpenter-Huffman of Rand and Konrad Kalba of Kalba-Bowen Associated. When it arrives at the National Science Foundation, it goes first to Charles Brownstein who made his own useful contribution to the development and completion of this work.

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I. INTRODUCTION

Interactive cable technology has the potential to provide adult and continuing education outside conventional institutions. Two central questions are: (1) Will sufficient numbers of students be attracted to and enroll in courses that rely on home terminals, allowing students to respond interactively to educational programs? and (2) Can these students use the system to make satisfactory educational progress? In other words, does interactive cable technology provide a means of reaching educational markets with effective programs beyond the classroom?

The basic data for the research questions have been generated by a series of educational experiments offered on the interactive cable system located in Spartanburg, South Carolina. A consortium formed by The Rand Corporation, TeleCable Corporation, and Spartanburg Technical College was funded by the Research Applied to National Needs (RANN) Program of the National Science Foundation to develop and evaluate a series of adult and continuing education programs. This report documents two sets of these experiments designed to test the value of providing students with the capability to send return communications from their homes. One set of courses was offered to determine whether adults who have not completed their high school education will take and learn from cable courses, perhaps because they escape some of the psychological and economic restraints associated with returning to the conventional classroom. A second set of courses was prepared for parents interested in the principles of child development and chosen to explore the market for continuing education among populations with an ability to pay.

In both lines of investigation, the project sought to test whether there was a demand for these types of courses and whether interactive technologies could enable the students to make significant educational gains.[1] In addition, the experiments were designed to illuminate the continuing debate over the federal government's role in supporting and regulating interactive cable service.

FEDERAL POLICIES AND INTERACTIVE CABLE

In the 1960s, there were great expectations that interactive cable television would permit a vast array of services to be available in the home. Varied entertainment programming would be available through pay cable—e.g., a heavyweight fight, a report on the latest archaeological dig in Crete, or a do-it-yourself plumbing program. The home terminal would enable you to order a new suit or groceries from a home buyer's guide. A home or business could have a fire alarm tied into the cable system, and branch banks would use inexpensive data services to increase their efficiency. Public utilities would be read automatically, and peak energy demands could be reduced by remote computer control of nonessential electrical components. Information and referral systems would help clients to find available

[1] Programs that test the use of the return capacity for two-way audio and video communication channels are discussed in S. Berryman, T. Bikson, and J. Bazemore, *Cable, Two-Way Video and Educational Programming: The Case of Daycare*, The Rand Corporation, R-2270-NSF, October 1978.

services and then to move efficiently through the local service agencies to get these services.

Education opportunities would also abound. It was expected that homebound and handicapped children could receive elementary and secondary education at home. Adults would take continuing education courses in order to get better jobs. Illiterate adults would learn to read, and others would finish their high school education. Professional education would include new medical techniques for physicians and special tax courses for small businessmen.[2]

Interactive cable technology was to be the key to this concept of a "wired city" interconnected with coaxial cable. Everyone agreed that no one service could justify the expense of the hardware, central systems, and operation of an interactive cable capacity, so the economic success of service delivery turned on two critical assumptions. First, because hundreds of services would share the central facility hardware and the maintenance of an interactive cable system, the cost of any one service would be low. Second, because hundreds of thousands of homes would use terminals across many wired cities, unit production costs for the terminals would be driven down. Then each home would be able to afford its own terminal, and subscribers would gain access to all these services at their own expense. What has happened to the price of the pocket calculator was often heard as an analogy to what would happen to home terminal costs. As a result, the cost of any specific service application was discussed as though the technology were almost free: The marginal cost of the hundred and first service on the system would be pennies, and the use of terminals would involve no additional costs because most people would already have them. Thus, for those believing in the wired city concept the question was not the cost of any particular service but centered on doubts about the extent of the market for these services and about the educational effectiveness of such systems.

As time wore on, it became evident that no such wired cities were going to appear in the near future. Initially, the economics of the cable industry were considered at fault. Construction of the interactive cable systems required to carry all the envisioned services cost substantially more than conventional cable systems. The market for these new services was not demonstrated, and profit to the cable system continued to come from selling subscriptions to homes wishing better one-way reception of commercial television signals.

Channel and Two-Way Cable Requirements Imposed by the FCC

Critics of this investment pattern acknowledged that there was no immediate profit in two-way services but pointed out that because there was only one cable system in any area, the construction of conventional systems was mortgaging the future. Without interactive systems, there could be no testing of service ideas, and it was felt that each community should have an opportunity to experiment. Fur-

[2] A sampling of the reports that discussed these and many other uses of cable is: Ralph Lee Smith, "The Wired Nation," *The Nation*, Volume 210, No. 19, May 18, 1970, pp. 582–606; National Academy of Engineering Committee on Telecommunications, *Communications Technology for Urban Improvement*, Washington, D.C., 1971; Sloan Commission on Cable Communications, *On the Cable: The Television of Abundance*, McGraw-Hill Book Company, New York, 1971, and Robert L. Steiner, *Visions of Cablevision: The Prospects for Cable Television in the Greater Cincinnati Area*, The Stephen H. Wilder Foundation, Cincinnati, 1972.

thermore, there was concern that the cost of retrofitting one-way systems for two-way use would be a barrier to the spread of two-way services when they did emerge.

This argument, coupled with other pressures, persuaded the Federal Communications Commission in 1972 to require a minimum channel capability for all major cable systems in the large metropolitan areas. A cable operator had to provide at least 20 broadband television channels including channels reserved for public access, education, and government use. And it required a *nonvoice* return capacity. This requirement is only for a limited return capacity able to carry data signals but not necessarily able to carry voice or video signals. The FCC specifically stated that it wished to create the potential for "surveys, marketing services, burglar alarm devices, educational feedback, to name a few."[3] The FCC then distinguished between existing systems and those to be licensed in the future. New cable systems would have to meet these requirements. Systems already licensed, however, were told that they had five years to comply, giving them time to spread out the costs of retrofitting.

Owners of the old systems had of course protested that retrofit was an unreasonable requirement, and with time the complaints grew stronger. By 1975, the cable industry had badly overextended itself. The image of huge profits that had fueled the imposition of these requirements changed dramatically, as many systems lost money and some of the major multiple operators skirted the edge of bankruptcy. And there was no evidence that the existing new services were about to prosper. The FCC responded by "postponing indefinitely" the retrofit requirement, but it still required the two-way capacity for the licensing of new systems.[4] The debate then moved to the courts, and the issue is a continuing controversy.

Although these regulatory concerns have dominated the public debate about cable, the alternatives facing the federal government are broader than simply requiring construction of the technical capacity for interactive cable communications.

Program Support for Interactive Services

It was argued in 1971 and 1972 that it would take forceful federal leadership to combine the numerous services required to achieve economies of scale and that new interactive services would not appear without a massive "wired city" to demonstrate the potential. A systematic review of all major U.S. cities and their cable systems was conducted to choose the best location for a federal demonstration of the potential of interactive cable, and lists of probable services were compiled.[5] Akron was widely discussed as the probable site; then the decision to commit money to the project was not made. Some of the reasons may have been political, but the fact was that HUD would have been committing many millions of dollars to support untested service concepts.

Subsequently, several federal agencies have explored innovative services by supporting demonstrations on a case-by-case basis. Only in the health field, however, was there any serious hope that new services might justify the costs of

[3] *Cable Television Report and Order* published in 37 Fed. Reg. 3251, February 12, 1972, par. 128.

[4] For a discussion of the postponement and the factors behind it, see *Broadcasting*, July 14, 1975, p. 22.

[5] Malarkey, Taylor and Associates, *Pilot Projects for Broadband Communications Distribution System*, prepared for the White House Office of Telecommunications Policy, November 1971.

advanced cable systems. The high costs of medical personnel and health care in general made cable, along with other telecommunications technologies, more appealing. The difficulty of bringing quality health care to rural areas has encouraged the use of satellites, microwave, and telephony as well as cable, and fostered the emergence of the field of "telemedicine." More recently, emphasis in discussions of demonstrations has shifted from urban to rural areas. But the integrated use of multiple services that would share the costs of an advanced system still has not materialized.

Commercial Development and the Regulation of Pay Cable

Another line of federal policy development with implications for innovative cable services has been the FCC's regulation of pay cable television. The cable industry has always wanted to offer additional entertainment programs above and beyond its carriage of commercial television signals. The backbone of such service would be movies and sports, but the FCC has been concerned that pay cable would drain away large audiences from broadcast television.

For years the broadcast industry sought protection, arguing that a decline in its audience share would mean that many television stations would no longer obtain adequate advertising revenues and have to go off the air. Most of these marginal stations were found in low population density areas. Faced with the possible loss of the only stations in many cable areas, the FCC placed a variety of restrictions on pay cable. Perhaps the most serious were the 1968 Report and Order restrictions on what movies and sports could be carried. For all practical purposes, a cable operator could not offer any movie that was between two and ten years old. Sports events could not be put on cable if they had been broadcast on commercial television in the previous two years. Reruns or extensions of commercial television series similarly could not be used. And the cable operator could not recover costs through advertising on a pay channel because that too was prohibited. Together, these and other restrictions made pay cable a marginal and unattractive investment.[6]

It has been argued that these rules are a major barrier to the achievement of the FCC's goal of fostering interactive services. Once pay cable was widespread, producers and syndicators would create and sell education programs to those who had the ability to pay. If there were a market for such educational programs, the service would grow, achieve economies of scale, and become less expensive. Then, the provision of an interactive capability would come about as the industry sought to bill viewers according to the programs they watched rather than by selling access to a channel. Several technical approaches allow a cable operator to charge each home on a program by program basis using an interactive billing system; and such systems could, in turn, be used for many other innovative services. Thus, some argue that, to obtain the capacity for interactive home education, one should begin by dropping restrictions on pay cable.

The FCC has in fact recently softened its restrictions, for the evidence has mounted that broadcast television stations would not in general be hurt severely. Pay cable on a per channel basis has begun to flourish, and now some 3 million

[6] For a discussion of these and other rules, see Steven R. Rivkin, *Cable Television: A Guide to Federal Regulation*, The Rand Corporation, R-1138-NSF, March 1973, p. 53.

homes are paying to obtain access to a channel carrying movies and sports. This trend will probably be accelerated; the courts have questioned the FCC's authority to place some of the restrictions on cable programming and have set some rules aside.[7] As pay cable grows, questions arise about the federal role in directing or encouraging the choice of cable technology used to carry pay television services. Some of these questions will be addressed in the last section with information gained from the Spartanburg experience.

EDUCATIONAL EFFECTIVENESS AND HOME MARKETS

The requirement that cable systems have a two-way capability and an educational channel, the drive for a federal demonstration, and the encouragement of interactive pay cable systems all assume that interactive cable has important social benefits, specifically that: (1) the programs will attract significant numbers of citizens, and (2) interactive cable programs are educationally effective. The Spartanburg interactive cable project was designed, funded, and carried out to question these two central assumptions.

The question about the value of interactive cable for attracting students is asking about the markets for interactive cable courses. On paper, there are vast markets for new forms of education. There is a solid base of 17 million adults now participating in education programs; and at a time when conventional college enrollments have leveled off, this group is projected to grow even without new forms of access. Other potential user groups are the educationally disadvantaged, or those tied to the home. Career-oriented education could serve professionals trying to stay current in their fields, women entering the job market late in life, or people interested in a second career.[8] But would these potential students actually enroll if the courses were offered on interactive cable?

A major purpose of the Spartanburg experiments was to provide some basis for judging how many of these potential students would enroll in interactive cable courses at home. The emphasis on home study stems from the unique technical advantages of cable systems in their capacity for widespread residential distribution of signals. Courses taken at schools, hospitals, businesses, and government agencies could be established economically using technologies other than coaxial cable (e.g., instructional television fixed service).

The public interest and the justification made for a federal role in regulating cable usually turns heavily upon the role of cable to reach into the home as a new means of educational opportunity. A residential distribution system can provide access to undereducated adults who wish to complete basic education; it can also improve access for the infirm, the handicapped, those tied to the home to care for children and the elderly, and those without transportation. The economic future of interactive educational programs on the cable turns on the home market because of the nature of the technology and the large numbers of home subscribers it can reach; and public interest is based heavily upon the hope of reaching those who do not have access to current educational programs.

[7] A recent and important case is *Home Box Office v. FCC*, Case No. 75-1280 (D.C. Circuit) 2 Med. L. Reptr. (1977).

[8] For a summary of trends and markets in adult education, see Michael O'Keefe, *The Adult, Education and Public Policy*, Aspen Institute Program for Education for a Changing Society, Cambridge, 1977.

The second question about effectiveness is simply: Will students learn using interactive cable technology? But that question leads to many others. What type of educational programming should be used on the cable system and what types of students should courses be prepared for? The technology is only part of a system that includes home terminals, computer software, program content, and teaching techniques that must be combined into a useful educational experience. The issue then is whether educational systems can be designed that can take advantage of the technical capacity of interactive systems. And the systems may not be effective for all types of students. It is not enough to know that motivated students with well-developed learning skills can be successful in, for example, accredited college courses. Much of the debate over the social value of interactive systems rests on its effectiveness for disadvantaged students, and information is needed on these and other student types.

The Spartanburg home education experiments were crafted to address these two questions of markets and effectiveness. Section II reviews the reasoning that led to the choice of the electronic classroom concept of education using live instruction and describes the dynamics of that system. Section III reports the results of three rounds of adult education programming to prepare students for high school equivalency examinations using that system. Section IV examines two rounds of parent education courses that considered the telephone as an alternative return technology. Section V returns to questions of effectiveness and markets and develops the implications of these experiments for federal policy.

II. THE ELECTRONIC CLASSROOM

Several approaches can be taken to use interactive cable technology for education, just as many different student audiences might be the target of home education programs. The Spartanburg project concentrated on home education for compensatory and continuing adult education and used live instructional programming. The basic method of presenting information was a live instructor. The teachers taught much as they would in their conventional classrooms, mixing lectures, questions, exercises, and live responses to questions. Students occasionally had the opportunity to speak with the teacher, but their primary mode of interaction was through the use of simple data terminals. Although the cable students could not ask questions spontaneously or make comments, the students could send prearranged signals indicating confusion, boredom, or a desire to ask questions. The teacher could respond at that moment, calling students by name if circumstances warranted it. In short, it was an "electronic classroom."

Here we review what is known about educational television and home education and how that information led to reliance on live instruction. Then we describe the components and dynamics of the Spartanburg interactive cable instruction.

MOVING FROM THE CLASSROOM TO THE HOME

The nation now has a great deal of experience with educational television. Although its use continues to encounter many institutional barriers, its effectiveness as an instructional medium in the classroom is unchallenged. The central assumption in much of the policy debate about the future of cable television services is that interaction is a useful tool in educational programming. In light of the much greater costs of such interactive systems, one must ask whether that technical capability is also a necessity. A brief review of the evidence serves to establish both why television can be a means of carrying educational programming into the home and why conventional cable and broadcast television without interaction are not by themselves sufficient for many student populations.

First, a large and compelling literature indicates that televised instruction is at least as effective as face-to-face communication of educational materials in the classroom and other group settings. In 1962, Schramm reviewed 393 studies that compared television learning with conventional classroom instruction (see Table 1).[1] In 255 of the studies, no differences were found in the relative effectiveness of the two modes. In the remaining studies, television proved to be somewhat more effective than conventional instruction.

Comparison of different age levels indicates a trend toward greater effectiveness of televised instruction with lower age and grade levels. Half of the studies of students at ninth grade levels or below found no differences, and when differences did exist, it was generally the television condition that was more successful. For

[1] Wilbur Schramm, "Learning from Instructional Television," *Review of Educational Research*, 1962, Vol. 32, pp. 156-167.

Table 1

RESULTS OF 393 COMPARISONS BETWEEN INSTRUCTIONAL TELEVISION AND CONVENTIONAL TEACHING (1962)

Grade Level	Number of Studies	Findings: No Significant Differences	Television More Effective	Conventional More Effective
3rd to 6th grades	152	86	50	16
7th to 9th grades	51	28	18	5
10th to 12th grades	90	57	12	21
College	100	84	3	13
Total	393	255	83	55

SOURCE: Wilbur Schramm, "Learning from Instructional Television," *Review of Educational Research*, Vol. 32, pp. 156-167.

high school and college students, the proportion of studies showing no differences increases, but when there are differences, the conventional classroom environment seems superior. Television instruction's least success was found at the college level, where only three studies concluded that television was significantly better than conventional teaching, and 13 studies found that conventional teaching was more effective than television.

A more recent review, drawing upon an overlapping but somewhat different body of research, reaches almost the same conclusion. Chu and Schramm (1967)[2] classified 421 studies according to whether the research found television or conventional education to be significantly more effective. Again, the clearest conclusion is that there are no major differences between the two modes (see Table 2). In 308 (70.8 percent) of those studies, no significant differences were found between television and conventional teaching in the classroom. Among studies that found differences, television appears slightly more effective for elementary and secondary school levels.

The Chu and Schramm review isolates research in which the students were adults. The type of televised education varies widely, from in-service training of teachers to instruction of military technicians, but again the central finding is the same: Televised instruction is at least as effective as conventional classroom teaching. Of 33 studies on adults, 24 found no significant differences between the two. In the remaining research efforts, television was more likely than conventional education to be the more effective mode.

The research on the educational use of television supports the premise that television can be effective for almost any type of educational content. Television can compete with live instruction in the classroom; and for adult and precollegiate students, television has outperformed conventional instruction in some situations. As a more recent review concludes, instructional television "can teach all grade levels and subject matters about as effectively as [traditional instruction], though some evidence indicates that it performs relatively better at lower grades."[3]

[2] G. C. Chu and W. Schramm, *Learning from Television: What the Research Says*, Institute for Communication Research, Stanford University, 1967, p. 13.

[3] D. Jamison, P. Suppes, and S. Wells, "The Effectiveness of Alternative Instructional Media: A Survey," *Review of Educational Research*, Vol. 44, Winter 1974, p. 38.

Table 2

RESULTS OF 421 COMPARISONS BETWEEN INSTRUCTIONAL TELEVISION AND CONVENTIONAL TEACHING (1967)

Grade Level	Number of Studies	Findings: No Significant Differences	Findings: Television More Effective	Findings: Conventional More Effective
Elementary	66	50	10	4
Secondary	122	82	24	16
College	202	152	22	28
Adult	33	24	7	2
Total	421	308	63	50

SOURCE: G. C. Chu and W. Schramm, *Learning from Television: What the Research Says*, Institute for Communication Research, Stanford University, 1967, p. 13.

The research has concentrated on the use of television in the classroom. It indicates what populations and curricular levels are likely to benefit from instructional television, but there is only limited research available on television instruction in the home. What is known about home instruction, however, leads us to emphasize the value of an interactive mode in many (but not all) circumstances.

Some home television programs have been remarkably successful. *Sesame Street* and the Children's Television Workshop have demonstrated that pre-school children watch, enjoy, and learn from their programs. Children from disadvantaged neighborhoods, rural areas, middle-class suburbs, and Spanish-speaking homes have acquired important learning skills from television.[4] Some have argued that we need "adult Sesame Streets" for the disadvantaged, but others note that the Children's Television Workshop had less success programming for young school-age children with *Electric Company*. The model of a quick, highly entertaining flow of concepts that is used by *Sesame Street* may not be as effective when used to present complex concepts to older populations.

Some college television programs have of course had considerable success. The Chicago Junior College system has offered its *TV College*. Promoted by and offered over WTTW, the Chicago educational television station; this set of courses attracts perhaps a half million viewers each semester, although formal enrollment is much smaller. From its inception in 1956 to 1970, 187,118 students had formally enrolled, 98,598 of them for credit. This instruction has proved to be comparable to classroom education, but for "*mature, highly motivated students.*"[5]

This emphasis on motivation constantly reappears in the television learning literature, and it may explain why studies comparing home television instruction with traditional classroom education have reached contradictory conclusions. For example, a study of nursing students compared those who viewed as a group in a hospital with those who viewed individually in their residences. It found that the nurses who watched the programs individually had significantly higher achieve-

[4] Gerry Ann Bogatz and Samuel Ball, *The Second Year of Sesame Street: A Continuing Evaluation*, Educational Testing Service, Princeton, November 1971.

[5] R. Bretz, J. Pincus, M. Rapp, and D. Weiler, "Models of Educational Television: A Draft Report," unpublished Rand research, August 1971, p. 35.

ment.[6] However, an evaluation of in-service training of Colombian teachers learning new math through television showed that the greatest gains were among viewers who watched in groups, and those who watched individually learned significantly less.[7]

The conflicting findings in these and other research studies have been attributed to the relative motivation of the students. For instance, in a study of eleventh grade students, a program on exploration in space was used to test for the learning gains of four groups: classroom and home viewers, each group divided into motivated (by promise of monetary payment) and unmotivated conditions. Both groups of motivated students performed higher than unmotivated students on tests taken after the program, and the less motivated students in the classroom did slightly better than the less motivated at home.[8] A major issue in home education is thus how the setting can provide incentives to learn for those of average or less motivation. The question becomes:

> If we must let the students view the program at home, to what extent will the lack of social support, the lack of competition, and the lack of interaction and supervision impair the amount of learning, and, if so what can we do to make up for these possible shortcomings of home viewing?[9]

These questions are familiar to those who have followed the history of home education. First the mail and now television and computer terminals have been used for home education. When used alone, or even when augmented by personal visits and telephone calls, they have had common difficulty in finding ways to enhance the motivation of students taking courses at home. Correspondence course dropout rates vary, but they are in general quite high. If as many as half the students who start a course stay until its completion, a course should be counted a success relative to other other home study programs. These disappointing rates have led to experimentation with ways to enhance motivation, and personal interaction seems to be a key. For example, in the University of Wisconsin Extension Division, personal visits and letters significantly increased work completion relative to a control group taking the same correspondence course without personal contact.[10] A review that included literature on correspondence courses, programmed learning, computer-assisted instruction, and television concluded that the common and primary problem cutting across these approaches is the need "to find ways to reduce the very large dropout rates encountered in almost all forms of home-based instruction."[11]

[6] June C. Abbey et al., "Home and Hospital Viewing of Continuing Education Broadcasts under Three Presentation Response Conditions," in T. S. Grant and I. R. Merrill (eds.), *Television in Health Services Education*, USOE Project No.164, San Francisco Medical Center, University of California, 1963, pp. 8–21.

[7] G. Comstock and N. Maccoby, "Instructional Television for the Inservice Training of the Colombian Teacher," *The Peace Corps Educational Television Project in Colombia, Research Report No. 6*, Institute for Communication Research, Stanford University, 1966.

[8] D. W. Mullin, "Retention as a Function of Motivation and Environment in Educational Television on the Secondary School Level," *Speech Monographs*, Vol. 23, 1956, pp. 118–119.

[9] Chu and Schramm, *Learning from Instructional Television*, pp. 81–82.

[10] H. W. Montross, "An Experimental Study of the Effectiveness of Field Assistance in Attitudes and Course Achievement of Correspondence Study Students," *Journal of Educational Research*, 1956, Vol. 50, pp. 161-173.

[11] E. Macken, R. van den Huevel, P. Suppes, and T. Suppes, *Home Based Education: Needs and Technological Opportunities*, National Institute of Education, April 1976, p. 69. This report is a rich summary of the scattered literature on correspondence study.

For those with strong incentives to learn because a course is a needed job credential or offered in a work setting, or for those who are educated and have positive experience and expectations about education, interaction may not be necessary. But many adults could benefit from the support and structure provided by interactive instruction.

Many attempts have been made to use interactive telecommunications to meet this motivational requirement. At the risk of grave oversimplification, we might group these efforts with home learning into three categories. The first is tape and film programs using high quality production techniques to engage the home viewer; the interaction is provided by supplementary activities such as discussion groups. The second is computer-assisted instruction and related computer programmed courses, which again may need supplementary activities. The third is the electronic classroom, which, like the others, has both strengths and weaknesses.

Supplemented Home-Study Television

The first category combines recorded educational programs with supplementary interaction. The prototype is the British Open University system and its American counterparts such as the University of Mid-America. These programs are in fact combinations of correspondence, mass media, and group discussions. Lectures are presented over the air, on both television and radio, but the backbone of these courses is well-designed materials mailed to the student's home. In addition, the students gather in discussion groups led by tutors. Here they share ideas, receive stimulation and guidance materials, and share a common social experience. As testimony to the success of this approach, there were well over 40,000 students enrolled in one or more of the Open University's 58 undergraduate classes in the fall of 1974. The average registered student watches two-thirds (65 percent) of the televised classes,[12] and the program has continued to grow.

Strictly speaking, of course, these programs are not confined to the home because students are required to travel periodically to study groups. Travel to a weekly seminar may be acceptable or even preferable for many types of courses. However, when the course would be more attractive if it were delivered entirely to the home, the supplemental interaction may also be provided through telecommunications. Although the use of interactive telecommunications to the home has not been extensively tested, there is evidence that this approach may work quite well. The Open University has used telephony for its tutorials, when distance and population density make it difficult to support study centers or send tutors into remote areas. Speaker telephones have enabled tutors to hold meetings remotely with study groups, and the approach has met with a fair amount of satisfaction.[13] This result is consistent with interaction experience in the United States. When television materials are accompanied by either face-to-face or audio communications with the instructor, students generally learn more. Live discussion in a class-

[12] A. W. Bates, *Student Use of Open University Broadcasting*, Institute of Educational Technology, Open University, I.E.T. Paper on Broadcasting No. 44, 1975, p. 27. The British make excellent use of radio and find it quite adequate for a large proportion of lecture presentations.

[13] Susan Holloway and Sandy Hammond, *Tutoring by Telephone: A Case Study in the Open University*, Communications Studies Group, Joint Unit for Planning Research, P/75025/HL, January 1975.

room after viewing a program,[14] consultation with the teacher after televised lectures,[15] and audio talkback systems[16] have all been shown to benefit learning. The Appalachian Educational Satellite Project has successfully mixed viewing hours with interactive hours in its transmission of in-service training programs to teachers at schools. A taped lecture is shown one day, and a subsequent program presents the same instructor and other resource personnel. A satellite radio link allows the teachers to interact live with the panel.[17]

Finally, a companion project to the Spartanburg experiment has also shown the effectiveness of interactive technology as a supplemental learning tool to educational programs. Michigan State University has been working with the Rockford, Illinios fire department in a project funded by the National Science Foundation's two-way cable program. Firemen have viewed training films at various firehouses under four conditions: simple viewing with no supplemental interaction, viewing with paper and pencil testing mailed into the central facility for grading and reaction, and two conditions using data terminals for interactive quizzes after each program. The supplemental interaction was provided by a computer that corrected and displayed answers to quizzes so that the firefighters knew how they had done as individuals, as a station house, and overall. Firefighters with this capacity, viewing either alone or as a group, learned more than those without an interactive capacity.[18]

Although much of this work has not been on home interaction, it would seem straightforward to use any number of electronic technologies to offer a supplementary means of responding to the lessons in televised programs. A taped program can be followed by live discussion, including interaction with the viewers using voice communications or data terminals for quizzes, or study groups could be scheduled regularly on another day. Many different systems can be envisioned, but they are alike in that the primary vehicle for the course would be high quality films and tapes and associated written materials, and interactive technologies would play a reinforcing role.

The CAI Alternative

Computer-assisted instruction (CAI) is an important and growing field of educa-

[14] The results suggest that discussion is more important for older students and more complex subjects. See the negative results about the value of discussion in B. H. Westley and L. C. Barrow, Jr., *Exploring the News: A Comparative Study of the Teaching Effectiveness of Radio and Television*, Research Bulletin No. 12, University of Wisconsin Television Laboratory, 1959.

[15] M. V. DeVault, W. H. Houston, and C.C. Boyd, *Television and Consultant Services as Methods of In-Service Education for Elementary School Teachers of Mathematics*, USOE Project No. 419, The University of Texas, Austin, 1962.

[16] Southwestern Signal Corps Training Center and Camp San Luis Obispo, California, *Instructor-Student Contact in Teaching by Television*, Training Evaluation and Research Programs, Part IV, Training Research Programs, 1953. Talkback systems have been used in the college classroom, but in that context the evidence has thus far been mixed about the utility of microphones. See L. P. Greenhill, "Penn State Experiments with Two-Way Audio Systems for CCTV," *NAEB Journal*, Vol. 23, 1964, pp. 73–78.

[17] See Frank V. Colton, "The Appalachian Educational Satellite Project," *Audiovisual Instruction*, March 1974, pp. 6–9. Also the technical report series, including W. J. Bramble, D. Maynard, and R. Marrion, *Summative Evaluation of Diagnostic and Prescriptive Reading Instruction K-6 Course, Spring 1975*, Appalachian Educational Satellite Project, Technical Report No. 12, Lexington, Kentucky, September 1975.

[18] "Exhibits" from a briefing by Thomas Baldwin, principal investigator of the Rockford Two-Way Cable Project, before the National Research Council Committee on Telecommunications, Washington, D.C., October 21, 1977.

tional technology, and one system in particular was designed especially for use on two-way cable systems. Understanding the case of TICCIT (Time-shared, Interactive, Computer-Controlled Information Television) is useful for appreciating the alternative futures of interactive cable and home education. TICCIT was developed by the Mitre Corporation for use on coaxial systems.[19] With this concept, each participating home has a terminal capable of being addressed by a central computer. The computer can generate frames of alphanumeric information and route them as addressed television frames of information. The flow of frames is monitored by the student's terminal until one arrives with that student's unique address. The terminal "grabs" that specific frame and continuously "refreshes" or repeats it so that the student's television set can be used to display the information frame. The student sees, for example, a question about fractions and four possible answers. The student picks the third answer and uses his terminal to send the message "3" to the computer. The computer then, as in any CAI program, uses the student address tied to the answer, determines whether it is correct or incorrect, and sends another frame that is another question, or perhaps recycles the student to the beginning of the lesson according to the logic of the CAI course. A single cable channel can be used by many students proceeding at different paces, engaged in different CAI courses. The system could also be used more generally as an information utility, providing shopping catalogs, legal aid, transportation schedules, specialized newspapers, and a variety of other possibilities.[20]

As remarkable as these possibilities are, home educational uses have been slow in coming. System costs are perhaps likely to remain too high for homes, but at a cost per terminal of $3,500, many institutions can justify the cost if the terminals receive steady use by many students.[21] TICCIT has been used in junior collges, on military bases, and in other settings, and is now marketed commercially.[22]

CAI, like educational television, has been studied far more systematically as a supplemental technology inside schools. There the student has the teacher to sanction and reward performance, and CAI is part of a broader social environment involving contact with peers who are also using the CAI system.

There is a wealth of other experience with CAI in institutional settings. The PLATO system, developed at the University of Illinois, has great flexibility and has been put to a wide variety of educational uses, particularly in higher education settings. It is now being marketed commercially by Control Data Corporation.[23] Among other systems, a notable success has been the recent report on the use of CAI for compensatory education in elementary schools in California. The CAI

[19] See Kenneth J. Stetten and John L. Volk, *A Study of the Technical and Economic Considerations Attendant on the Home Delivery of Instruction and Other Socially Related Services Via Interactive Cable TV, Volume I: The Social Aspects of Interactive Television*, Mitre Corporation, McLean, Va., M72-200, May 1973.

[20] Mitre Corporation, *Interactive Cable TV for Home Delivery of Instruction and Other Social Services: Volume III: The Social Aspects of Interactive Television*, Mitre Corporation, McLean, Va., M72-200, February 1974, p. 20.

[21] This figure assumes a 100 terminal system and minicomputers. John R. Ball and Timothy S. Eller, *Interactive Cable TV for Home Delivery of Instruction and Other Social Services: Volume II, Technical and Economic Considerations of Interactive Television*, Mitre Corporation, McLean, Va., M72-200, February 1974, p. 74.

[22] *An Overview of the TICCIT Program*, Mitre Corporation, McLean, Va., M76-44, July 1976.

[23] *Control Data PLATO System Overview*, Control Data Education Company, Minneapolis, 1976, describes the capabilities of the system and offers a bibliography on PLATO.

system in the Los Nietos School District has reportedly reversed a 16-year decline in achievement scores relative to national norms.[24]

But at home, isolated from these social settings, will a student be motivated to learn? The safest answer is that we do not know. A study of specially chosen, exceptionally bright children who were given CAI terminals near Stanford University encountered a drop-out rate of 35 percent, even with a proctor calling and encouraging continued participation.[25] However, TEL-CATCH, a home CAI system used by severely handicapped children near Buffalo, N.Y., is apparently a substantial success.[26] The results probably vary according to the training, motivation, and personality of the student.

Live Instruction

A third approach is the use of a live instructor who would interact with students at varied locations through the use of telecommunications. Each student has some electronic means to communicate with the instructor during the class, so that the instructor's responses are televised live and spontaneously. Such a program would not be as individualized as CAI, where each student can proceed at different schedules when using the computer as the primary interactive mode, nor would live instruction have the polish of scripted and rehearsed productions. But the students can be given a sense that the instructor knows they are there and cares about their progress.

In some future environment of electronic home education, perhaps the only sure prediction is that there will be a mix of many approaches. For some, passive viewing of well-produced educational television will be sufficient. CAI will be a supplementary tool for some courses but may be the primary educational vehicle for others. Any live interaction will be used both for review of sessions of prepared films and for the entire courses. For that reason, it is pointless to argue their relative merits. Each has its advantages, depending on the course content and the type of student. But three reasons stand out to explain why a live instructional approach will make an important contribution to this new environment: the cost and availability of programs and the need for human contact, and most important the value of local context and identification.

Television programming and CAI packages are expensive to prepare and the costs must be defrayed by extensive use. The National Instructional Television Center has encouraged the establishment of consortia to share costs and to ensure widespread use, but these are major undertakings. The production of the *Ripples* series was planned and executed by early childhood experts and television specialists from 14 agencies, took two years to produce, and cost $12,000 an hour in the early 1970s. A health education series with 31 consortium members was to cost $90,000 an hour. [27]

[24] See the testimony of Nelson Crandell in hearings on "Computers and the Learning Society," U.S. House of Representatives Committee on Science and Technology, Subcommittee on Domestic and Internal Planning, Analysis and Cooperation, Washington, D.C., October 6, 1977.

[25] Macken et al., *Home Based Education*, pp. 51–55.

[26] A brief description is available in the article "U.C.P.A. Is Pilot for TEL-CATCH Program," *UCPA Newsletter*, United Cerebral Palsy Association of Western New York, Spring 1977, Vol. 1, No. 2, p. 1. For details of the system, see *TEL-CATCH*, United Cerebral Palsy Association, Buffalo, mimeo, n.d.

[27] P. Carpenter-Huffman, R.C. Kletter, and R. K. Yin, *Cable Television: Developing Community Services*, Crane, Russak & Company, Inc., New York, 1974, p. 151.

CAI programs are even more expensive and take longer to develop. In 1972, the National Science Foundation committed $15 million to develop and test CAI programs for two technologies. The developers of the PLATO system at the University of Illinois received $5 million from the federal government and $5 million from the State of Illinois and other sources. The Mitre Corporation, Brigham Young University, and the University of Texas were given $4 million to develop remedial mathematics and English CAI courses and install them on a TICCIT system at two junior colleges.[28] Results were only becoming available in 1977, and even with that commitment of time and money, student achievement, although positive, did not compare favorably with conventional lecture courses.[29]

With extensive reuse, program costs are shared by more and more users, although the expense of maintaining, copying, and marketing programs can add substantially to the cost of educational programs. The Cambridge series for high school adult education, which consists of 30 half-hour programs, can be purchased for $2990. Where federal and state agencies supported the production of series, costs of subsequent reuse can become quite acceptable for a local agency. However, even if consortia can produce and distribute programs, there is still the problem of program diversity.

Over time, there may be sufficient television material for introductory college courses, secondary school subjects, and other mainline curricula, but finding quality programs is quite difficult in many fields. If—as many believe—the initial focus of cable education is to be continuing education at home, then one will need programs on flower arranging, plumbing, and crochet as well as accounting, English skills, and specific job training programs. There is substantial reason to expect that the cost and scarcity of prepackaged courses leads naturally to having the same staff that now offers the course in the classroom present the information over television. At the least, this staff will be used until the market is sufficiently large to support quality program production in highly specialized areas.

Whether live instruction will continue to be a major vehicle for electronic education after an extended transitional period may turn on the need for human contact and the role of localism in programming. Many of the students who elect in the future to take home education will not remember school with fondness. Critics of CAI have argued that it is dehumanizing and cannot encourage such students, but CAI supporters note that some students find it refreshing not to have to deal with a teacher. The answer may vary from one student to the next. All we maintain here is that some forms of home education may require interactive human contact, and that is another reason to develop a live instructional approach alongside supplemented educational television and CAI.

The most important factor in the future of interactive programming is the value of local context and community identification. Attitudes toward child care and discipline, the role of the church in education, and many other social values vary substantially from one community to the next. Programming produced in metropolitan centers that departs from different assumptions or portrays settings quite dissimilar from those of the viewers risks losing its intended audience. The

[28] "NSF Funds Major Department, Testing of Computer Assisted Instruction Systems," *National Science Foundation News*, NSF-72-122, Washington, D.C., March 10, 1972.

[29] Donald L. Alderman, *Evaluation of the TICCIT Computer-Assisted Instructional System: Progress Report*, Community College Educational Testing Service, Princeton, July 1976.

availability of resources and simple facts of geography also vary and make some forms of instruction difficult. A teacher's suggestion that the student go to the local library destroys rapport when the library is a bookmobile on a country road. Finally, there is the important role played by psychological identification with the instructor, or others in the program. The Piedmont accent of the mathematics teacher in Spartanburg strengthened her rapport with her students, just as watching neighbors and other Spartanburg residents on other programs apparently strengthened the educational process. Locally produced, interactive programs can be tailored to the values of each community, can draw realistically on the resources of the community and the students, and can permit the student to identify more closely with the instructor. These advantages suggest that the local, interactive approach will continue to be an essential part in the future mix of instructional courses on the cable.

THE SPARTANBURG SYSTEM OF INTERACTIVE EDUCATION

Live instruction with the electronic means to provide for student-instructor interaction was seen as one of several alternatives, but one that could play an important role in the development of home education. It was chosen as the basic method of presentation in the Spartanburg home education experiments. It then remained to carry out that decision on the TeleCable Corporation's Spartanburg system.

The interaction in the home could in theory use any of several return capabilities, including return video and voice communications. As a practical matter, we decided to focus on the use of return data transmission. Although a return video and voice capability is perhaps a richer form of human communication, it creates a series of problems for the organization and direction of the interaction. A teacher in a lecture hall with 200 students knows that only a handful can make points or ask questions in any given class. To set up a voice network where all the students at home can speak freely to a teacher in a studio risks confusion and disruption. A teacher could try to switch to students who signal a desire to speak, but then they would need a capacity to send a data signal to indicate that request. Thus the simple data terminal was seen as necessary whatever communication mode was required, and it had important advantages of its own. The data terminal could be used for quizzes and questions about comprehension, and a modest central computer could provide diagnostics on student progress. The teacher could manage very large classes by having aggregate counts and percentages of student performance as well as being able to identify specific student answers.

The economics are also heavily in favor of the data terminal. Simple data terminals produced in very large quantities may have unit costs in the $100-200 range, within reach of home consumers. A return voice capacity would add considerable expense, perhaps even doubling the cost, and a camera and modulator for return video would cost $2,000 or more. And, if a voice linkage is required, why not first try the telephone for supplementary voice communications?

A further consideration was the possibility that the cable television industry would be putting simple interactive terminals into homes for commercial uses. If

a home education program could succeed within the technical constraints these commercial terminals would probably impose, the prospects for the spread of the interactive cable approach would be much brighter.

Such terminals might be capable only of being polled by a computer to determine what button a home subscriber had pressed. The TOCOM systems, used in Woodlands, Texas, have home terminals that send signals from burglar and fire alarms. The terminals also have the capacity to send discrete signals to a polling computer that can be programmed for educational uses.[30] If cable operators move to a system of charging viewers by the program on an extra channel of pay cable entertainment, those systems can provide interactive polling terminals for home program selection. The terminals being put in place in the Warner System in Columbus, Ohio, can also be used for interactive education.[31] It seemed that the most important interactive capacity for Spartanburg to test would be educational approaches that relied on simple interactive terminals and were not tied to a specific technology. In that way, the Spartanburg system could be readily adapted for use in locations where polling terminals would already be in the home.

There are many other approaches that could be used (e.g., giving students full alphanumeric capability), but this reasoning led us to use a system that relied on the simplest possible pushbutton response for the home. The telephone was to be used in a supplementary role, but the basic interaction between teacher and student was to be based on the teacher responding live, picture and voice, over a cable channel to students sending very simple signals. If this technical approach were successful, there was reason to believe the system could be replicated on other cable systems, and we could be confident that approaches using more sophisticated and flexible technology would be effective as well. The danger was that a failure of such a primitive system would leave a great deal of uncertainty about whether providing more flexible terminals would lead to different results. Polling terminals seemed to play such a key role in the probable futures of cable, however, that the risk seemed necessary.

The TeleCable of Spartanburg Plant

The interaction was to be carried out in Spartanburg because it was the site of one of the most advanced physical plants in 1973 for two-way signals. The foundation of any interactive system is the cable plant, and the Spartanburg project was based on the system owned by the TeleCable Corporation.

TeleCable is a multiple systems operator, owning and maintaining 15 cable systems; and their Overland Park, Kansas, system was the site of some important pioneering work on the use of two-way. Among other tests, two severely handicapped teenagers were taught in a class over cable by a teacher who normally would have visited them individually.[32] While TeleCable learned something about the positive educational and social benefits of creating an electronic group for the socially isolated, they also encountered some painful technical experiences. When

[30] For a current summary of the capabilities of the Woodlands TOCOM system, see "TOCOM Expanding 2-Way CATV Subscriber Base," *Electronic Engineering Times*, January 9, 1978, p. 14.

[31] See "Two-Way Cable Poised for Major Test in Columbus," *Broadcasting*, November 21,1977, pp. 42–43.

[32] Rensberger (1971) p. 16; "Dialing Up a Dialogue on Cable," *Broadcasting*, May 31, 1971, p. 5.

they won the Spartanburg, South Carolina, franchise, TeleCable used what they had learned and built a state-of-the-art, two-way cable system.

Like any conventional coaxial cable operation, the Spartanburg plant first receives over-the-air broadcast signals at a tower and carries them to a central distribution point. From this hub, cable radiates out into residential areas as the signals travel over first the main or "trunk" cable, then feeder lines, and finally over "drops" into individual homes. The lines are carried on utility poles and consequently follow the same lines as telephone and power service. Every few hundred yards the signal begins to weaken, and it is boosted by amplifiers. A key difference between a conventional (one-way) system and an interactive (or two-way) system is that in a one-way plant these amplifiers are capable only of relaying a signal "downstream" to residences. In a two-way system these amplifiers have both a forward and a return capacity.[33]

TeleCable designed the system with four trunks, and amplifiers were installed to carry 27 channels of television forward to cable subscribers. Using the standard television set tuner, all subscriber homes have access to 12 channels of television programming and automated news and weather service. When the experiment was begun, there was no programming on the remaining 15 forward channels and no converters were in use. Thus homes participating in home education programs could be provided converters to give them access to the other forward channels, where the education classes could be conducted with some privacy.

The remaining frequency space on the cable was devoted to return transmission. There was a capacity in the sub-low band for four full audio-video television channels to be transmitted from any point on the cable system back to the system hub. And the same space could be used alternatively for hundreds of return data or voice transmissions. Because of TeleCable's earlier experience in Overland Park, they chose equipment and sought to supervise construction so that the system was as tight as possible, holding to a minimum the ingress of electronic noise into the system. When the system was turned on in 1972, its performance tests suggested it was among the best two-way cable systems then available.

Interactive Terminals and Their Functions

The interactive system was based on equipment provided by Interactive Systems, Inc. (ISI), which was the only company that had proposed a system within the project's cost limitations in response to a competitive solicitation. ISI designs and markets specialized communications systems using coaxial cable in large industrial plants. Their terminals can transmit data from remote locations along cable to a computer interface, where they are processed and displayed. Their terminals had a complete alphanumeric data entry capacity, and the only major modification in the equipment necessary was the elimination of that capability. Because of the decision to test the efficacy of courses relying upon simple polling terminals, we decided to use a push-button handset as the input device separate from the basic terminal. The modified ISI terminal was to be placed behind the television set, and the handset was connected to it by a 15-foot cord. The student was then free to place the handset on the coffee table in front of the television set,

[33] For an introductory description of cable systems, see Walter S. Baer, *Cable Television: A Handbook for Decisionmaking*, The Rand Corporation, R-1133-NSF, February 1973.

select one of eight signals to be sent, and then start its transmission by touching the "send" button (see Figs. 1 and 2). The computer polls each terminal, determines the choice indicated, and displays the choice on a television-like CRT in the studio for the teacher to read.

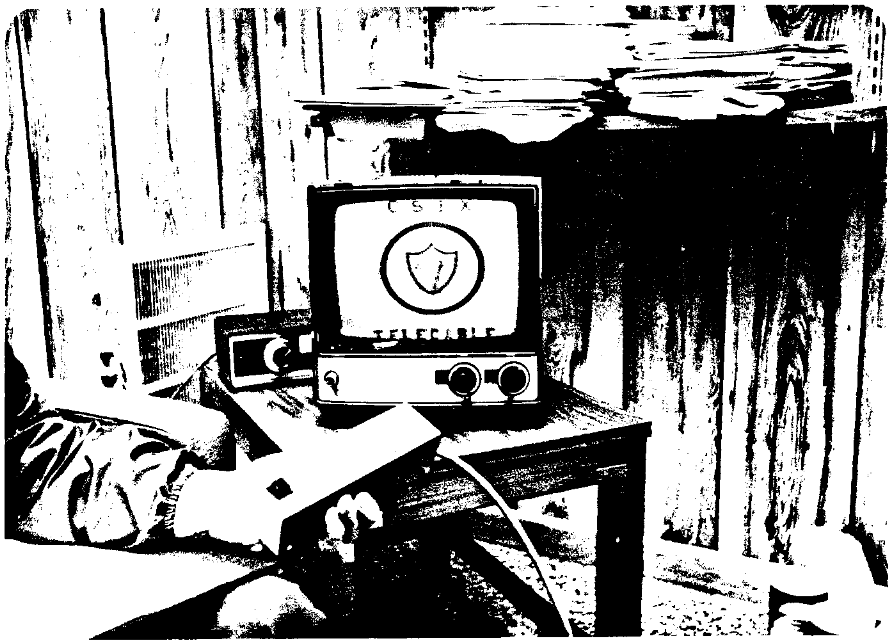


Fig. 1—The home terminal handset

Fig. 2—A GED student with remote handset

Neither the cable system nor the interactive technology could be considered as an advanced prototype. TeleCable and ISI were justifiably proud of their technical contributions to the project, but everyone agreed that we were using readily available technology. The project's state-of-the-art technology of the early 1970s has today been superseded by the flow of engineering development. Those interested in sophisticated technology should look elsewhere. What was accomplished in Spartanburg can be done on most modern cable systems constructed since 1972.

If there was an innovative aspect to the Spartanburg system, it was in the application of the technology rather than the technology itself. It is easy to imagine the instructor giving the class a question with five possible answers, and asking them to punch in the correct response. Formal questioning was, however, only one of several interactive modes that the teacher could adopt, and in each mode the computer provided an ongoing account of student participation and diagnostics about student participation and about student performance. This system was driven by the teacher's terminal, which was beside the CRT display (see Figs. 3 and 4).

The first command entered by the instructor was to press the "roll" button (Fig. 5). The display would then list the names of all students enrolled in the class. The teacher would then look back into the camera and ask the students to "log in." Students, seeing the teacher on their home television sets, would press the "8" button on their handset and send it (Fig. 6). As students thus reported their presence, their names would disappear from the screen. The teacher could acknowledge their attendance, "Good Morning, Dick; Hello, Lynda," to personalize the interaction, and would then usually call the names remaining to confirm they were ab-

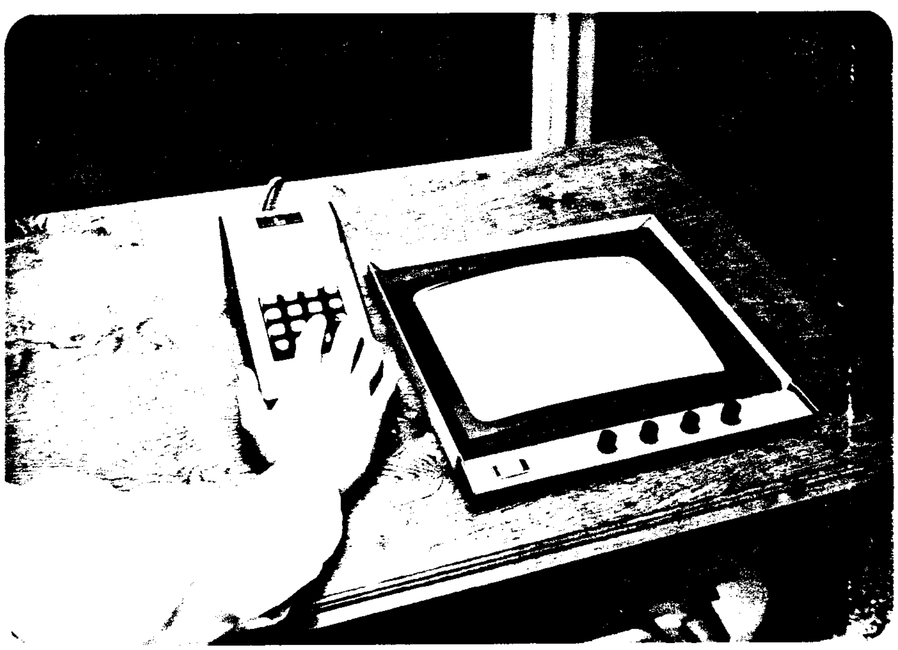


Fig. 3—Teacher's terminal and display device

Fig. 4—Teacher lectern and studio

sent.[34] Thereafter, the number of students in attendance would be listed on all displays. If for any reason a student entered the class late, the number would increase. Or, if students were called away, they were encouraged to hit "8" to log out. The teacher at any time can call up the absence list to reexamine the current attendance.

Then the teacher might enter the quiz mode for formal questioning by pressing "Q" on the master terminal. The teacher could turn to a prepared poster with a question and alternative answers, or instruct the class to turn to a page in their workbooks and enter the correct choice of answers for the first exercise. The student simply punches the second button if the second answer seems the correct one. The teacher then enters the correct answer on her terminal, and the computer lists all students in attendance, the answer they entered, and the percent correct, incorrect, and not answering.

The students cannot see the display, and so they know only what the teacher chooses to tell them. Simple reinforcement, "Very good, Henry," was a common

[34] Privacy is a serious concern in two-way cable communications. First names were used routinely in the GED courses to protect student identities.

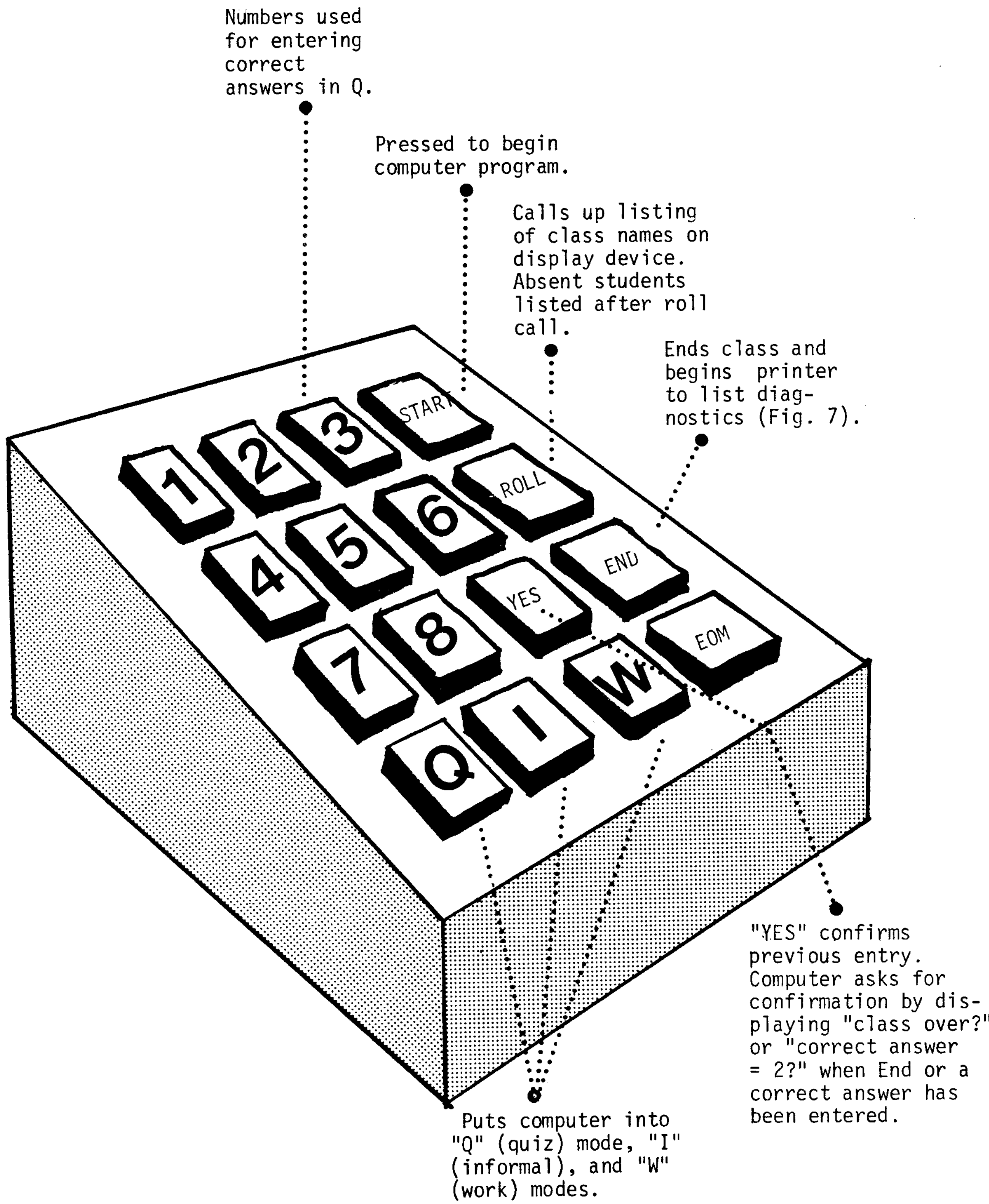


Fig. 5—Uses of teacher terminal

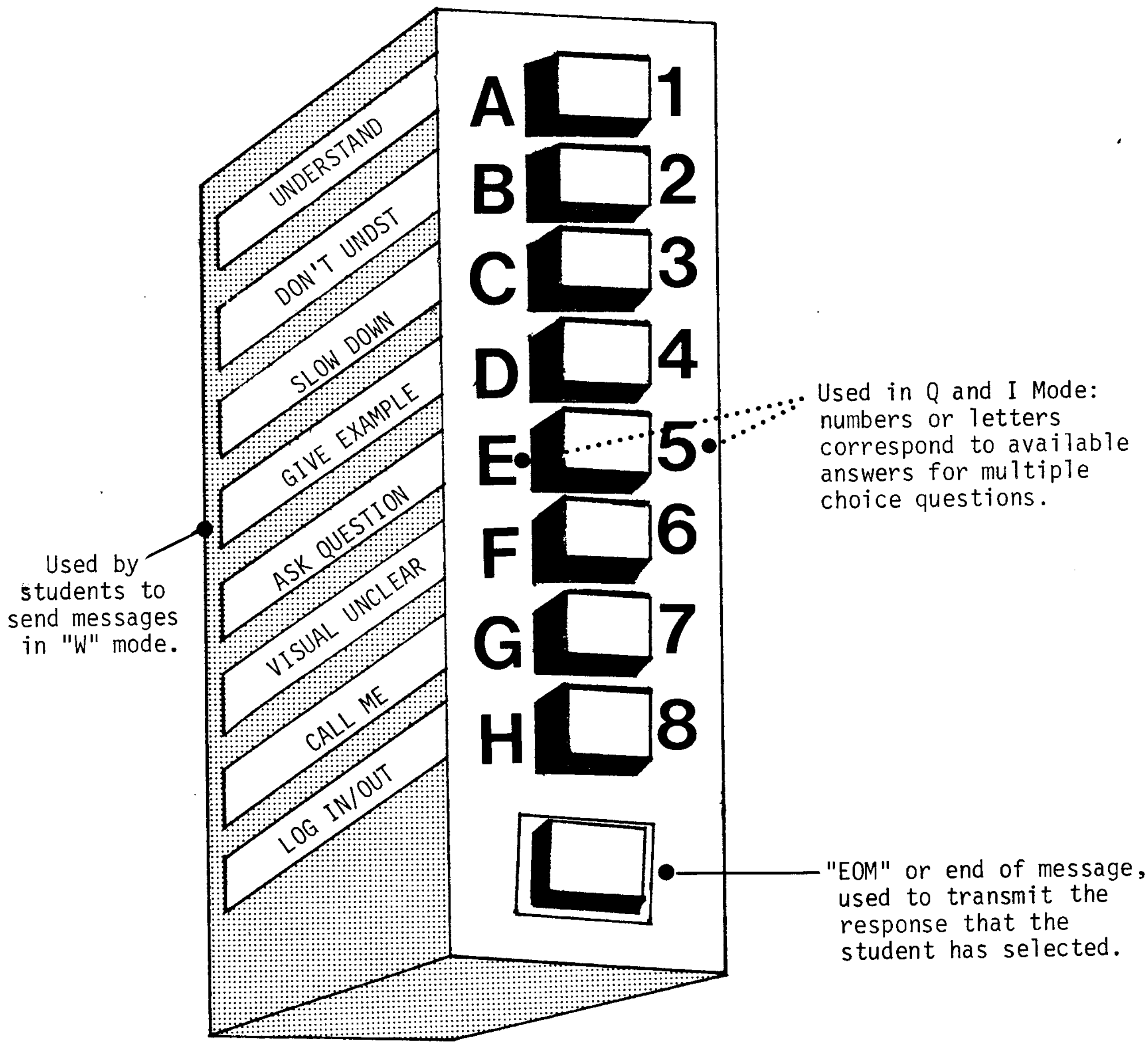


Fig. 6—Uses of student handset

teacher response, or "Come on Gordon, you've got to try to answer," another. Or the teacher could see that a large portion of the class selected the same wrong answer, and the lecture could focus on clarifying the principle involved.

The distinguishing characteristic of Q mode is that there is a formal question put to the whole class, and answers are right or wrong. These answers are compiled by the computer and are kept as a record of student performance. To keep such answers separate from procedural questions or more informal interactions, a second question mode was established. The teacher pushes the "I" button and then asks the class questions about whether they found the last instructional module "easy or hard, 1 or 2," setting up a quick cue system. Alternatively, a particular student could be called upon to answer true (1) or false (2) questions. Student names and their answers simply appear on the teacher's display.

When the teacher is not explicitly addressing questions to the class, the system is placed into a third, "working" mode, usually used when the teacher lectures. After the teacher hits the "W" button, the screen is blank except for the current number logged in, and the student is given the initiative. The seven buttons ("8" is reserved for logging in and out) are assigned specific codes for common student reactions to lecture presentations. These varied somewhat from one course to the next, but the basic signals were "understand," "don't understand," "slow down," "give example," "ask question," "visuals unclear," and "call me." When a student felt, for example, that he was lost and wanted elaboration, he could punch his fourth button. Because the teacher had the class in work mode, the computer would interpret it as a request rather than an answer. The student's name would appear and alongside it "GIVE EX." The teacher, as in any other classroom setting, is free to disregard the request if after a few classes it is apparent that that student is usually quite slow. But if another student signals "SLO DOWN," the teacher might immediately respond, feeling that if that student is behind, so is the rest of the class. Similarly, the "CALL ME" request can be ignored as if it were a raised hand in the classroom, acknowledged but postponed, or the student may be called up or told to call in on the telephone.

At the end of the class, the teacher presses the "clear" button, which dumps the computer memory and readies it for the next class. In Spartanburg the computer printed out for each student the answer to every formal question; the total right, wrong, and not responded to; and the total for each type of student-initiated response in the work mode. These printouts were potentially a valuable teaching aid. For instance, students who had frequently sent in a signal that they "understand" who then failed to respond or logged out later in the class are likely to have been bored, and students who left early after asking for the teacher to "slow down" or "give an example" might need special assistance (Fig. 7).

The modes thus divide into class time periods where either the teacher or the student has the initiative. It was hoped that the working mode would be used during much of the course because it gave students some control over the pace and direction of the class and moved them away from being passive responders. A distinction was made between the two questioning modes so that a system of diagnostics could be created, providing summaries of individual student progress quite superior to that available to the teacher in a lecture hall.

(a) First Page: Student-Initiated and Informal Interactions

Adult Education Class Report   Class: Math   Date: 2/16/76

Code	1	2	3	4	5	6	7	I
J. D. Birch	0	0	0	0	0	0	0	4
C. D. Chisman	0	3	3	0	0	0	0	6
Barbara Daw	0	5	0	0	0	0	1	5
Dalton Ford	0	6	8	2	2	0	0	6
A. Goodenough	3	0	0	0	0	0	0	4
Brian Hill	0	7	5	0	0	0	0	0
Joan Lyle	0	7	3	0	0	0	0	6
Barb Marlowe	0	0	0	0	0	1	0	6
Chris McManus	2	4	7	0	0	0	0	2
Shirly Osmand	0	2	6	0	1	0	0	4
John Perloff	0	0	0	1	0	0	0	6

Cumulative count for work made by code. Shirley Osmand signaled Code 3 ("slow down") six times in the 90-minute class. The codes are:

1 = Understand
2 = Don't Understand
3 = Slow Down
4 = Give Example
5 = Ask Question
6 = Visuals Unclear
7 = Call Me

Cumulative count of responses to informal questions. John Perloff responded six times to teacher questions.

Code 8 was reserved for logging in and out of class.

N.B.: These are fictitious names.

Fig. 7—Example of summary statistics on class interaction

(b) Second Page: Individual Student Answers in "Q" Mode

Question Number

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Correct Answer	2	3	4	2	1	1	3	4	2	2	5	4	5	2	1	3	2	1	4	5
J. D. Birch	2	3	1	2	1	1	3	3	2	2	5	4	1	2	3	3	2	1	2	5
C. D. Chisman	1	3	4	2	1	1	3	4	2	1	5	4	5	2	1	3	2	1	2	5
Barbara Daw	3	3	4	2	1	2	3	5	2	2	5	4	4	1	1	3	3	1	4	5
Dalton Ford	2	0	4	0	3	0	0	0	0	2	5	3	5	0	0	3	2	1	4	5
A. Goodenough	2	3	2	5	5	1	5	3	2	2	3	4	5	2	1	1	0	3	4	2
Brian Hill	2	3	5	2	2	1	3	2	1	2	5	1	1	1	3	2	2	1	4	5
Joan Lyle	2	3	4	2	1	1	3	4	2	0	2	5	5	2	1	3	3	2	2	5
Barb Marlowe	1	3	4	2	1	2	3	2	2	2	5	4	4	2	1	3	2	1	4	2
Chris McManus	2	5	4	2	1	1	2	4	3	3	5	2	5	2	3	1	4	1	4	2
Shirly Osmand	2	3	4	2	1	1	3	5	2	2	5	1	5	2	1	3	2	1	4	1
John Perloff	2	3	4	2	2	1	3	4	1	2	1	4	5	1	3	3	5	5	2	5

(c) Third Page: Student Summaries in "Q" Mode

Class Summary

	R	S	T
J. D. Birch	15	5	0
C. D. Chisman	17	3	0
Barbara Daw	14	6	0
Dalton Ford	10	2	8
A. Goodenough	10	9	1
Brian Hill	11	9	0
Joan Lyle	14	5	1
Barb Marlowe	15	5	0
Chris McManus	11	9	0
Shirly Osmand	17	3	0
John Perloff	12	8	0
Totals	146	64	10

R = Total number correct
S = Total number incorrect
T = Total number of times student did not answer

Fig. 7—Continued

Communications and the Studio

The studio for the presentation of the educational material was kept as simple as possible. Polling terminals cost money, and even if they were free, setting up studios and interconnections between educational institutions and cable hubs will be expensive. It is doubtful that the use of interactive cable technology for home education will be economic if one must add the cost of quality production to the cost of the interactive hardware. Moreover, the educational concept being tested is that most instructors could take their normal presentations into the cable studio.

This requirement meant that the studio was very simply equipped. The television cameras were inexpensive black and white models, using available artificial lighting. The studio crew evolved to being a single person, usually a part-time college student with modest experience in studio work. A class would largely switch back and forth between two cameras, one focused on the teacher, and the other on the graphics display in use (blackboard, posters, or slide screen). Table 3 shows that the investment in programming and transmission equipment was remarkably small. Even including the video tape recorder, needed for training but not for the actual classes, the cost of equipment for producing the classes and getting the television signal from the studio out on the cable was $8141.

The interactive equipment was of course quite expensive. This project was a research effort, using equipment that had not been manufactured in quantity for home markets. For the purpose of the home education experiments, $65,709 was spent for interactive equipment, computer programming, the home terminals provided the students, and ancillary equipment. Each student had $462 of equipment in his or her home.[35] The TeleCable Corporation loaned the project a small computer at no cost, and a great deal of labor was involved in preparing and maintaining the cable system and the student terminals. At present, the interactive equipment is probably more expensive than many local educational agencies can afford by themselves.

As a consequence, Table 3 lists what would be required if pay cable television, home alarms, or other commercial services were supporting the installation and maintenance of an interactive cable system and the provision of home terminals. In such an environment, home terminal costs would be much lower, and that cost would be borne by the home subscriber to obtain a commercial service. *Without the presence of such commercial services, interactive home education with polling terminals is prohibitively expensive for years to come.* Even if the system costs are largely supported by commercial services, there remains the need for the teacher's equipment, a small computer, and the costs of programming it. The computer components could be provided by the cable operator using his available computer memory and programming personnel, and it is difficult to predict what these costs might be. We have assumed, however, that the most acceptable solution for an operation of an interactive system would be to have a minicomputer dedicated to educational uses. It would process the polling responses collected by a central computer owned by the operator. To that cost, one must add a high speed printer for the diagnostics, the teacher's terminal, display device, and ancillary equipment. Using the Spartanburg costs as a guide, providing the interactive capacity to the

[35] The equipment was a converter ($52), a handset ($50), as shown in Fig. 1, and a home terminal for receiving and transmitting data from the home ($362). This cost would of course be much lower for handsets and terminals manufactured in quantity.

Table 3

STUDIO EQUIPMENT COSTS FOR INTERACTIVE EDUCATION PROGRAM

Studio Programming and Transmission	
Monochrome television cameras (2)	$1704
Set of 3, 5" camera monitors	765
Video switches	119
Audio mixer	518
Audio level controller	72
Studio monochrome monitor/receiver, 11"	252
Slide projector and concave screen	244
Adjustable chart stands	22
Video tape recorder	1394
Video tapes, 3/4" cassette (24)	604
Microphone and cord	27
Converter	49
Modulator	1084
Tunable output module	750
Pass band filter, channel K	76
	8141
Interactive Teaching[a]	
Monitor and controller for alphanumeric display	1266
Lectern	225
Master terminal and handset	550
High speed printer	3468
Computer	14000
Computer programming, software documentation, and training	14900
	34409
Total studio equipment cost	$42550

[a]This cost does not include the student terminals and other essential elements in an interactive cable system. It does reflect the marginal costs for studio equipment that educational institutions would pay if home education programs were to add on a two-way cable system being used for home alarm systems or for per program pay cable television service. The computer estimate is based on a Hewlett-Packard HP-2116C at the 1971 commercial price.

teacher in the studio might cost $34,409. The total equipment cost would then be approximately $42,550.

This cost is a barrier for a single course, but if the teaching studio is used by several institutions and for several courses a week, the costs seem well within reach. Because this equipment can be shared with other cable programs, a full-scale system with several programs would allow several uses of the studio to share these costs over the life of the equipment. At one point the studio was being used comfortably to produce 27 hours a week of programming. Assuming that the use rate in a mature two-way cable system could average 27 hours a week throughout the year, and amortizing the equipment over a five year life, we estimate that the equipment comes to $6.30 per hour of programming. Add $3.50 per hour for the single cameraman required for producing the program, and the production and

transmission cost in the Spartanburg adult education project could be $9.80 per hour, excluding teacher salaries.[36]

The dominant cost is not equipment, but rather the cost of the teacher's time. The teachers could handle three classes a day, and they could teach three 15-week courses a year, so we can allocate one-ninth of a teacher's salary to teaching a single subject to one class. Using this full-time salary, rather than an hourly rate, allows time for teacher training for the course, out-of-class administrative duties, and preparation of graphics and other materials. For all three teachers, this cost would have come to $3587 per course.[37] For 180 hours of instruction, that cost can be broken down to $19.90 per hour. Thus the total cost for an hour of interactive cable instruction was $29.70, or $5351 for a 15-week course. The cost of the teacher's time is roughly the same in both conventional and classroom settings, and the marginal cost of offering the interactive cable program is just under $10 per hour.

The resulting programs should not be thought of as "television." The courses did not live up to even minimal standards of local commercial television, but—if the electronic classroom concept is viable—the student involvement comes from the steady use of the interactive terminals rather than from the entertainment value of the programs. Spartanburg was then to be a test of the power of interactive communications coupled with inexpensive live instruction.

These interactive terminals, the computer programs, and the studio resources composed the foundation of the Spartanburg home education experiments. There are, however, human, organizational, and curricular factors that are equally essential to system success. The courses must be "sold" to the potential audiences. Instructors must choose and present their materials effectively, adapting them to the interactive functions. Students must accept the system and feel comfortable using it. Approaches to these problems varied across the experiments according to the nature of the students and the subject matter. The dynamics of the system can be illustrated if we examine the use of the interactive system for high school equivalency education.

[36] There was no set-up time and no rehearsal. The one person "crew" would turn on the room lights, turn on the cameras, wait a minute, and then start. Color television, requiring balanced lighting and camera settings, involves greater labor costs.

[37] This figure is based on the average teacher salaries in 1975 and 1976.

III. INTERACTIVE INSTRUCTION FOR THE EDUCATIONALLY DISADVANTAGED

The most severe test of home learning is in reaching those without a basic high school education. It is those who already have benefitted from formal education who tend to enroll and succeed at home study.[1] If people with less past education can be successful at home using this simple interactive capacity provided in Spartanburg, it will prove the system to be a significant educational approach. Thus the first question is whether the educationally disadvantaged can be motivated to enroll, to stay in the class, and to learn. The importance of the approach as an outreach mechanism for compensatory education turns on the further question of how many students enroll. If only a few students come forward to take home cable classes, there may still be good reason to encourage the growth of interactive cable, but it would be hard to justify a major investment of public funds.

To address these questions, Rand carried out a series of quasi-experiments to demonstrate the use of two-way interactive cable television as an alternative to traditional adult education in the classroom and to test the relative effectiveness of the two forms of instruction. Courses in mathematics, reading, and language skills were offered through Spartanburg Technical College (TEC) to adult students to prepare them for the South Carolina General Education Development (GED) examinations. Instruction was provided to a series of two groups: a conventional class at Spartanburg TEC and students with interactive terminals who received the instruction over a closed cable television channel in their homes.

ADULT EDUCATION: NEEDS AND PROGRAMS

The starting point was the identification of student needs. Because the experiment was intended to inform a national audience as well as Spartanburg officials, we gave first priority to educational needs that were prevalent in the nation as a whole as well as in northwestern South Carolina. High school education for adults stood out as a student need.

In a nation that prides itself on its free and general education, there are still many adults without adequate schooling. Over 52 million Americans who were 25 years or older in 1973 did not have four years of high school education; 17 million had completed less than eight years of schooling; 6 million had completed less than five years.[2] Every state in the union has programs seeking to ameliorate this problem, but the need will continue long into the future. Nationwide, 25 percent of all high school students still drop out before they receive a diploma.[3] In addition to the costs inherent in the loss of the broadening and self-fulfilling experience of

[1] See the review of the literature in Macken et al., *Home Based Education*, pp. 23–25.

[2] U.S. Bureau of the Census, *1970 Census of Population, General Social Economic Characteristics*, Final Report PC(1)-C1,United States Summary, Washington, D.C., 1972.

[3] The drop-out statistic was provided by staff of the National Center for Educational Statistics, U.S. Department of Health, Education, and Welfare.

continuing education, these statistics imply closed job opportunities and a substantial loss of income in a society that has come to regard completion of a high school education as a minimum credential for employment.

Adult education is a problem with national dimensions, but it takes on massive proportions in South Carolina. South Carolina ranks 49th in the United States as measured by median years of education (10.5 years). In 1970 almost one-third (29.4 percent) of its adults did not have an eighth grade education; well over half (62.2 percent) of South Carolina's adults have not finished high school.[4] Within Spartanburg County, 39.6 percent of the adults 25 years of age and older have not completed ninth grade; only 35.1 percent have a high school education. In the city of Spartanburg, which makes up most of the cable area, the picture of educational deficit is much the same: 31.7 percent of adults 25 years and older have not completed ninth grade; only 45.6 percent have a high school diploma (Table 4).

Table 4

EDUCATION LEVELS OF ADULTS OVER 25 YEARS OF AGE IN THE COUNTY AND CITY OF SPARTANBURG

	Adults Attaining that Level			
	County		City	
Education Level	Number	Percent	Number	Percent
Less than 1 year of school	2,207	2.3	462	1,9
1 to 4 years of school	8,415	8.9	1,727	7.2
5 to 7 years of school	17,870	19.0	3,611	15.0
8 years of school	8,863	9.4	1,834	7.6
9 to 11 years of school	23,730	25.2	5,501	22.8
12 years of school	17,994	19.0	4,104	17.0
More than 12 years	15,209	16.1	6,887	28.6

SOURCE: U.S. Bureau of the Census, *1970 Census of Population, General Social Economic Characteristics, South Carolina*, PCI(1)-C42, Washington, D.C., March 1972.

A variety of programs throughout the state of South Carolina seek to meet these educational needs. In 1973-74, for example, schools, colleges, hospitals, businesses, and prisons served 71,983 adults enrolled in state programs (see Table 5). The vast majority of students took night courses, and 35,117 (half of the total) took those courses in the public schools. Another 14,974 students enrolled in community colleges.

In Spartanburg, the providers of adult education are more limited; the public schools and Spartanburg Technical College account for most of the adult education enrollment. Each of Spartanburg County's seven public school districts has some type of adult education, usually in the form of night classes meeting in one of the schools. In 1973-74, a reported 1,395 adults enrolled in the basic or high school programs through the school districts. By far the largest enrollment (582 students) was that of School District Seven, which includes most of the city and much of the

[4] U.S. Bureau of the Census, *1970 Census of Population, General Social Economic Characteristics*, Final Report PC(1)-C1 United States Summary, Washington, D.C., 1972.

Table 5

SOUTH CAROLINA ADULT EDUCATION PROGRAMS, 1973-1974

Institution	Number of Participants	Number of Day Classes	Number of Evening Classes
Elementary/secondary schools	35,117	69	2,484
Community colleges (2-year colleges, technical institutes)	14,974	93	143
Learning centers	6,733	65	73
Correctional institutes	3,830	27	29
Hospitals	364	12	9
Work sites	1,421	38	9
Other (includes 4-year colleges)	9,544	93	246
Total	71,983	397	2,993

SOURCE: The data are from the *Adult Education Performance Report, South Carolina, 1973-74,* Office of the State Director of Adult Education, mimeo, October 1974.

Spartanburg cable system. Spartanburg TEC had an adult education enrollment of 1,419 that year, roughly the same size as that of all the public schools in the county.[5]

By two standards, the adult education services in Spartanburg are inadequate. First, the total enrollment is a very small proportion of the potential student population. In Spartanburg County, for example, the school districts and Spartanburg TEC serve about 2.0 percent of the adult population in need of basic education and 4.6 percent of those needing high school education. These figures warn that it may be difficult to attract students into adult education programs. Second, a substantial proportion of the enrolled population do not complete the program they begin. In 1973-74 in Spartanburg, 32.2 percent (906 students) of the enrolled adults dropped out of their program of instruction.[6]

By a third standard, however, the value of South Carolina adult education programs is evident. Those who enroll in adult education programs reap benefits that go beyond the intrinsic value of education itself. In Spartanburg in 1973-74, 174 of these adults obtained jobs. Another 266 enrolled in further education or training programs.[7] Thus the problem of adult education is not one of resources but one of reaching out to enroll students and then keeping them involved in the courses.

Data gathered on barriers to student enrollment suggested that telecommunications can play a significant role in strengthening the adult education services in Spartanburg. After setting aside those who dropped out of adult education programs for unknown or for positive reasons (e.g., to take a job), data from 1973-74 showed that 25.5 percent of the remaining dropouts discontinued their education because of difficulty in arranging transportation. Another 12.2 percent dropped out because they had problems in arranging for assistance at home with child care, health care for adults, or related family difficulties. Cable television is not likely to

[5] Enrollment and performance data were compiled from district "Participant Progress and Separation Data by Instructional Level" reports to the State Office of Adult Education, State Department of Education, 22-015-00, 1973-74.

[6] Ibid.

[7] Ibid.

help with the 37.1 percent who left simply because they lost interest, but some barriers could be overcome by educational television in the home.[8]

These figures do not take into account those adults without any form of transportation and those completely tied to the home with family and child care who could not even enroll in the first place. Spartanburg thus seemed an ideal site to test the promise of interactive cable for compensatory education.

PROGRAM CONCEPT: GED CURRICULUM

The curricular approach for the interactive classes was chosen after a review of ongoing programs in South Carolina. There are two approaches to adult high school education. The first, emphasized by the Spartanburg public schools, leads to a high school diploma. Students take a series of courses that together provide sufficient credit for graduation. The local Spartanburg schools are proud that the successful students in this program participate in regular commencement ceremonies where they receive their diplomas along with the graduating class. However, the scheduling problems, the number of instruction hours, and the cable channel capacity that would be required for a 12-course curriculum made this program a poor candidate for television instruction.

Spartanburg TEC's contrasting approach is to have students take a high school general equivalency degree program. The TEC students are taught skills aimed specifically at satisfactory performance on the statewide GED test, which, although not a regular diploma, is accepted by South Carolina employers as equivalent. For the purposes of instructional television, the TEC approach was preferred because it involved a single class that makes fairly consistent progress across a common curriculum. Incidentally, the Spartanburg TEC program relied upon standard texts and workbooks used throughout the United States (see Fig. 8). The program content was thus comparable to many others in the nation, enhancing the generalizability and replicability of this series of experiments.

If there is any difference that would make TEC's programs unusual, it is that the GED instruction is more homogeneous and test-oriented than in many other such programs. TEC's experience has led them to favor less emphasis on self-paced instruction at this level because it seems to have been an isolating experience for the student, adversely affecting motivation. Strict programmed learning materials have caused problems by allegedly dehumanizing teaching and led TEC to move toward more group-paced instruction. This emphasis makes their conventional classroom instruction more readily adaptable to a television approach than might be the case in other cities and states.

Thus, the traditional classroom and televised programs under the present experiments could follow the same formats and use the same curricula, holding that aspect of the experiments constant. Regardless of which comparison group an individual selected, he or she was offered 180 hours of instruction over 15 weeks, three hours a day for four days a week.

The initial six months of the project, from August 1975 to January 1976, were spent in preparation. The central idea was to present a two-way class over cable television in the same way a teacher would teach students in an actual classroom

[8] Student reasons for separation are compiled from the 1973-74 district reports, ibid.

Joseph Bellafiore, *English Language Arts*, Amsco School Publications, New York, 1969.

John A. Beyrer, *Correctness and Effectiveness of Expression: Preparation for the High School Equivalency Examination*, Cambridge Book Company, New York, 1973 revised edition.

Jules Burstein, *General Mathematical Ability: Preparation for the High School Equivalency Examination*, Cambridge GED Program, Cambridge Book Company, New York, 1973 revised edition.

Isidore Dressler, *Preliminary Mathematics*, Amsco School Publications, New York, 1965.

Eugene Y. Farley, *How to Prepare for the High School Equivalency Examination Reading and Interpretation Test*, Barron's Educational Series, Woodbury, New York, 1970.

Richard Miner, *Interpretation of Reading Materials in the Social Sciences*, Cambridge GED Program, Cambridge Book Company, New York, 1973 revised edition.

John T. Walsh, *Interpretation of Reading Materials in the Social Sciences*, Cambridge GED Program, Cambridge Book Company, New York, 1973 revised edition.

Fig. 8—Instructional materials for Spartanburg TEC's GED curriculum

and to do so at the lowest possible cost. The concept of a classroom in the studio was adopted to allay staff worries and audience expectations of an elaborate television network-style production. Three instructors employed by the Adult Education Division at Spartanburg Technical College were assigned to the cable project under the coordination and direction of the Dean of Adult and Continuing Education. Their attitudes toward the cable program varied. One who was recruited as a replacement was very anxious about the system; another was eager to try it. These teachers then began to develop a workbook for supplementary materials to be used as review and test materials throughout the course and to prepare visual aids necessary for the cable class.

The work on materials was then integrated with teacher training in a process designed to acclimate the instructors who would be teaching before a television camera.[9] First, each instructor developed a notebook of supplementary materials to be handed out to students and used as review and test materials throughout the course. The importance of these materials in the learning experience of the students was significant. If a student was having problems in a particular area, the teacher would assign specific review lessons from the supplementary notebook.

[9] Jocelle Heatherly, "Spartanburg Technical College Interactive Cable Television Program for Adult Education, 1975-1976," Spartanburg Technical College (unpublished report), 1977.

These lessons were reviewed with the student in the individual work mode during the next class, while other class members were working on regular assignments.

Second, the teachers began to prepare appropriate visuals for their classes. Because cable classes were to be transmitted in black and white to minimize costs, extravagant visuals were eliminated from consideration in the beginning. The main visual in the cable classes as well as the classroom was the blackboard. However, posterboards were also used for presentation of new material and multiple choice questions, and filmstrips and slides were sometimes used.

Perhaps the most difficult task of the planning period was preparing the teachers for television cablecasting. As a conscious choice, the project staff agreed that the course should be offered by teachers without any previous television experience. If live instruction is to become a general phenomenon, each school or college will be selecting and training local teachers. The heart of the electronic classroom concept is that institutions without special media departments, training, or consultants will put their instructors into the cable studio. Consequently, we wished to know how much training would be required.

Initially, the idea of teaching to a camera instead of students intimidated the teachers. They felt that the ability to communicate enthusiasm and warmth to students who enroll in GED classes was essential, and they questioned their ability to project that feeling through the camera.

The process of overcoming these fears and bringing the teachers to the point where they could relax took three months, each teacher taking approximately 65 hours before the cameras and in review. In the beginning, the instructors taped 10-minute segments explaining some aspect of a lesson and then reviewed their own performance. The taping time was gradually expanded to cover the actual length of each adult education class (90 minutes), and then group sessions were conducted to review samples from each teacher's presentation. As the instructors began to relax and feel comfortable before the camera, they became their own worst critics. They knew before viewing their tapes whether they would be pleased with their work. Each instructor appeared to set her own goals of what her teaching should be, and the teachers carried over their different teaching styles from the conventional classroom.

Research Design

The basic design for the adult education experiments was "quasi-experimental."[10] The participating students received one of two treatments: conventional classroom instruction at Spartanburg TEC or instruction over interactive cable in their homes. The design is quasi-experimental because true experimental designs require the random assignment of subjects to treatment groups to avoid the possibility that self-selection could lead to initial differences in the two groups of students. As originally conceived, the experimental design assumed sample recruitment from among students in the cable area who ordinarily enroll in GED courses at TEC and random assignment of this sample to treatment (two-way) and control (classroom) conditions. However, lessons from some preliminary experiences with recruitment in fall 1975 precluded such a design. TEC draws students from three

[10] D. T. Campbell and J. C. Stanley, *Experimental and Quasi-Experimental Designs for Research*, Rand-McNally, Skokie, Illinois, 1966.

counties, and only a fraction of the usual enrollment of TEC students are cable area residents—students able to be hooked up for the cable television instruction. Random assignment to two groups, even assuming maximum participation of students, would produce class sizes too small for confident analysis.

Furthermore, we discovered a reasonable selection bias affecting willingness to participate. Some of the students who enroll for GED classes at TEC do so because they have transportation to get to class and want the social support of the classroom setting. Home television instruction is neither necessary nor desirable for students who are anxious to get out of the house.

For these reasons, we relied on a quasi-experimental design in the experiments. The usual TEC enrollees constituted the classroom comparison group. Students in the two-way cable group were specially recruited through mail flyers and newspapers, radio, and television advertisements. Steps were taken to control for obvious differences in the two groups.[11] Veterans and participants in the Comprehensive Manpower Training Program (CMP) were excluded from both groups as subjects in the experiments because the incentive structure for their attendance and performance was thought to be different from that of most other students. Veterans and CMP students were being paid to attend, and their dropout rate was unusually high, probably because of the lack of other than financial incentive for attendance. TEC continued to be responsible for serving those students seeking coursework, and several veterans and CMP participants were allowed to enroll in the conventional classroom. Their class performance was not, however, included in any data analysis reported here.

Experimental Series

Four adult education experiments were conducted, including three rounds of high school equivalency education and one basic adult education course to prepare students to enter a high school course. In spring 1976, GED preparatory classes were offered by the same instructors to cable and traditional classroom students. Because three instructors teach mathematics, English, and reading, it was possible to establish a rotating schedule that kept the instruction in both the cable and conventional class quite comparable. The mathematics instructor taught the cable class from 8:30 to 10:00 a.m., and then drove to Spartanburg Technical College to teach the conventional class from 10:30 a.m. to 12 noon. The English instructor taught the reverse schedule. On days when the reading instructor taught comprehension of science and social science, she would teach both groups one after the other. The progress of the two classes was not always at the same rate, so the curriculum was not exactly the same every day, but in general the two classes received comparable instruction from the same instructors each day.

The second round in fall 1976 repeated the GED classes and added a pre-GED course for adult students functioning on a sixth grade level. This basic course was offered in the morning on a rotated schedule so that the same instructors were teaching both cable and conventional classes. The purpose was to improve a student's academic abilities sufficiently to allow him or her to enter the GED preparatory class. In addition, we hoped to gain experience with the cumulative effective-

[11] The comparability of cable and non-cable area residents will be examined with data available from a city-wide survey of the educationally disadvantaged in Sec. V.

ness of two home interactive classes. Students completing the fall class would be encouraged to continue and enroll in a GED class. In the evening during fall 1976, a second home interactive cable class offered GED instruction. The same instructors who taught the previous spring taught this and both morning classes. The GED conventional class used as a comparison in this round was offered by different teachers. In spring 1977, a final GED course was offered to both cable and conventional classes in the morning, again with the same instructors.

Each round followed the same sequence. First, Spartanburg Technical College advertised in the newspapers and on radio and television. Supplemental recruitment strategies were used. Those calling to inquire about the course who lived outside the cable area were encouraged to enroll in a conventional class to enhance the comparability of the two groups, and all GED students were scheduled for placement tests. Students placing in the achievement range between eighth and twelfth grades were enrolled in the GED program, and the cable class was given an orientation to the program including a visit to the teachers' studio. Thereafter, there was no face-to-face contact between the instructors and the cable class.

The number of students enrolling was quite small. The enrollments for the GED cable courses were 10, 10, and 12 over the three rounds plus 10 who participated in the pre-GED class. This result hampers the research, but it was hoped that group comparability would permit pooling of the GED classes to allow data analysis on a more robust sample. These 42 students, plus the 90 students in the comparison group in the conventional classes, provide an adequate base to draw reasonably firm conclusions about the educational effectiveness of the system. However, the implications of the small market response for these courses are equally important, and this topic becomes a separate research question. This issue will be set aside until it is explored in depth in Sec. V, which considers the markets for home education.

THE DYNAMICS OF INTERACTIVE EDUCATION

All too often, analysis stops with the nature of the resources put into a system. In Spartanburg one can compare the results of the same teachers offering the same curriculum to two groups, one having return data terminals and others in the conventional classroom. This emphasis on inputs does not tell us how the teaching process itself changes when the instructors and students are in an electronic environment. The decision was made to capture the nature of the classroom process information by systematic observation for several reasons. First, such process information could serve a purely descriptive purpose in helping to understand the dynamics of the conventional and cable classrooms, such as organization of time, nature of class activities, and patterns of interaction. Second, the process information was envisioned as useful in making teachers aware of their use of time and their teaching style, thereby enabling them to adapt their teaching to the potential of the instructional mode. Finally, having a record of differences in the process of instruction dictated by the instructional mode could prove valuable in explaining any group differences in outcomes that might emerge.

To serve these purposes, a classroom observation instrument (see Fig. 9) was designed to establish profiles of the pedagogical process in both conventional and cable classes. It includes both the distribution of classroom activities (the activity

Observer______
Date______
Subject(s)______
Time______
# of students______

Check one:
Tec ______
Cable______

	1 a	1 b	2 a	2 b	3 a	3 b
Teacher Substantive Presentation						
Classroom Substantive Discussion						
Individual Work Period						
Drill						
Substantive Drill						
Procedural Information						
Student Dominated Activity						
Examination or Quiz						
Equipment Adjustment						
Teacher Works with Subgroup						
Nondesignated Activity						

Closed
Individual: I______ Class: C______ C-I______
Open
Individual: I______ I-Ex______ Class: C______ C-Ex______

Understand
Individual: I______ I-re______ I-re-Ex______ Class: C______ C-re______ C-re-Ex______
Student Initiated: S______ S Ex______

Routine
Individual: I______ I-Ex______ Class: C______ C-Ex______
Student Initiated: S______ S Ex______ Done______

Rhetorical | Individual | Student Interaction

Closed
Individual: I______ Class: C______ C-I______
Open
Individual: I______ I-Ex______ Class: C______ C-Ex______

Understand
Individual: I______ I-re______ I-re-Ex______ Class: C______ C-re______ C-re-Ex______
Student Initiated: S______ S Ex______

Routine
Individual: I______ I-Ex______ Class: C______ C______ C______ C-Ex______
Student Initiated: S______ S Ex______ Done______

Rhetorical | Individual | Student Interaction

Closed
Individual: I______ Class: C______ C-I______
Open
Individual: I______ I-Ex______ Class: C______ C-Ex______

Understand
Individual: I______ I-re______ I-re-Ex______ Class: C______ C-re______ C-re-Ex______
Student Initiated: S______ S Ex______

Routine
Individual: I______ I-Ex______ Class: C______ C-Ex______
Student Initiated: S______ S Ex______ Done______

Rhetorical | Individual | Student Interaction

Fig. 9—Classroom observation instrument

record) and the frequency of classroom interactions (the interaction record). Events falling in either of the two areas were coded continuously to present a moving record of the instructional dynamics in the classes.

Ten categories of class activity were defined that were expected to represent the major components of the teaching process (Fig. 10). Some categories, such as teacher substantive presentation, take much the same form in both environments.

Teacher Substantive Presentation: The classroom activity is characterized by the teacher giving a presentation or explanation intended to convey subject-matter and related information.

Classroom Substantive Discussion: The classroom activity is characterized by verbal interactions between pupils or the teacher and pupils on the subject matter content being presented by the teacher.

Individual Work Period: The classroom activity is characterized by students working individually on assigned work.

Drill and Substantive Drill: The classroom activity is characterized by the teacher asking students narrow questions—that is, questions requiring one or two word replies or yes or no answers; questions requiring specific responses. If, during the drill, the teacher either repeatedly asks students to explain how they arrived at their answers or the teacher interrupts the drill to substantially expand the answers, the activity is coded *Substantive Drill.*

Procedural Information: The classroom activity is characterized by the teacher giving and/or students eliciting instructions or information *not* directly related to subject matter contents.

Student Dominated Activity: The classroom activity is characterized by an individual student making a presentation to the class.

Examination or Quiz: The classroom activity is characterized by students taking a quiz or examination on which they will receive a grade or other written evaluative feedback.

Equipment Adjustment: The classroom activity is characterized by efforts to adjust the cable equipment.

Teacher Works with Subgroup: The classroom activity is characterized by the teacher intentionally separating out a subgroup of students with whom to work. The teacher acknowledges that certain students need special help and therefore gives other class members something to do so she can work intensively with those students needing special help.

Nondesignated Activity: The class is engaged in activities other than those designated in the other activity categories.

Fig. 10—Brief description of activity record categories

Drill and substantive drill could occur in both contexts, but one would expect the availability of the terminals to lead to more time being devoted to this activity in the cable classes. Substantive verbal discussion could occur only in one context.[12] Thus the activity profile would show how the instructor's use of time changed as she moved to an electronic setting.

The interaction record also used five categories to count the frequency and type of interaction in the cable course and the conventional classroom used for comparison (Fig. 11). Closed-ended questions, where the student chooses among a set of alternative answers, are inherently the form of interaction in the cable class. The open-ended question category is the normal form of face-to-face dialogue. Questions about student understanding of the substantive material, about classroom administration and procedures, and rhetorical questions can be asked in both contexts.

The CLOSED Category: A closed question is coded when the teacher asks a question about the subject under study for which the student(s) are to select the answer from a given list of alternatives.

The OPEN Category: An open question is coded when the teacher asks a question about a subject under study for which the student(s) must provide an answer without the benefit of having several response alternatives before them to choose from.

The UNDERSTAND Category: The Understand category is used to code (a) teacher questions aimed at determining whether students understand or are clear on subject matter related content that has been gone over in class and (b) student-initiated questions or comments that reflect the extent to which the student understands subject matter related material that has been covered in class.

The ROUTINE Category: The Routine category is used to code teacher and student initiated questions that are procedural (rather than substantive) in nature.

The RHETORICAL Category: The Rhetorical category is used to code questions that are not intended to elicit a response. Rhetorical questions are generally a reflection of a teacher's speaking style.

Fig. 11—Brief description of interaction record categories

The classroom observation showed that the instructional process does indeed change substantially when the instructors use interactive cable. A sample of 102 ten-minute observation periods in spring 1976 indicates that the amount of time spent by the three instructors in a typical 90-minute class was comparable across conditions for some activities and widely variable in others (see Table 6). Lectures

[12] For cable classes, the telephone was used as a supplementary means of student-teacher discussion. In the first round, students frequently called after class during the teacher's office hours for student consultation. Subsequently, students were also permitted to call the teacher during class, and the teacher had the option of allowing the rest of the class to hear the discussion. This latter capacity was rarely used.

Table 6

DISTRIBUTION OF ACTIVITIES AND INTERACTIONS BY CONDITION, SPRING 1976

	Classroom	Cable
Minutes of Activity Time per Class[a]		
Teacher substantive presentation	10.8	11.8
Classroom substantive discussion	16.4	0.0
Individual work	26.7	53.8
Drill	0.0	0.5
Substantive drill	22.3	15.8
Procedural information	8.4	6.5
Student-dominated activity	0.0	0.0
Examinations or quizzes	0.0	0.0
Equipment adjustment	0.0	0.9
Teacher works with subgroup	1.4	0.0
Nondesignated activity	4.0	0.7
Total minutes	90.0	90.0
Frequency of Interaction per Class[a]		
Closed-ended questions	14.0	17.4
Open-ended questions	35.2	0.0
Questions about understanding	47.6	9.8
Procedural questions	13.8	12.7
Rhetorical questions	12.9	5.4
Questions asked by students	14.8	0.0
Total frequencies	138.3	45.3
Total Minutes of Observation	516	497

[a]Data from 102 observation periods of 10 minutes duration are used to create a profile for a typical 90 minute class.

and the presentation of substantive material were roughly the same for the conventional (10.8 minutes) and the cable class (11.8 minutes), as was the time spent on procedural and administrative matters (8.4 minutes in conventional and 6.5 in cable). Because no substantive student-to-student discussion took place in the conventional class without the direction of the teacher, there was no difference there.

The striking differences were found in the individual work periods. Because these adult students do very little work out of class, the long hour and a half sessions (two each day) are used in part to give them a chance to work quietly on their own. In the conventional class, 26.7 minutes of the typical class were spent with no interaction as the students did exercises at their desks. In the cable class, the figure leaped to 53.8 minutes. It was recognized beforehand that the substantive discussion consuming 16.4 minutes of the conventional class had no simple equivalent on the cable. The assumption was that drill activities, with and without substantive instructor comment interspersed between student answers, would fill the gap. Instead, there was less drill in the cable class.

The interaction record confirmed this picture. The teacher directed an average of only 17.4 closed-ended questions about the material to the cable class, over one every six minutes. The conventional class average was almost as high, 14.0 closed questions per class; in addition, that class was addressed with 35.2 open-ended

questions. The instructors were, however, much more likely to need to ask how well the class was doing in the conventional class. The teachers were not conscious of the difference and could not account for the reason behind it. The interactive cable response was either giving them more confidence in the state of progress of the cable class, or it made it more difficult to ask quick questions about understanding.

In discussions of the results with the teachers, it was clear that the cable system could be used more effectively. The absence of nonverbal cues from students impatient to move on led the individual work periods to be overextended, and it suggested that more use of closed-ended questions be planned.

Adapting the Teaching System

One of the major strengths in the research strategy of the Spartanburg project was the decision to conduct sequential experiments. This approach permitted the project to gain experience with the content of the programming, method of delivery, use of the technology, and the research instruments. The only regret the staff felt was that all the applications were not tested with serial experiments. When that approach was used, as was the case for both the high school equivalency and parent education programs reviewed in the report, important benefits resulted.

In the case of the adult education programs, the teachers could learn to adapt their teaching styles to use the interactive technology more effectively. Emphasis was first placed on reducing the time invested in individual work periods and increasing student use of the terminals.

Over time, these goals were realized. As shown in Table 7, the percent of cable class time spent in individual work dropped from 59.8 in spring 1976 to 42.7 and

Table 7

THREE EXPERIMENTAL ROUNDS

	Round One Spring 1976		Round Two Fall 1976	Round Three Spring 1977	
Type of Teaching Condition	Classroom	Cable	Cable	Cable	Classroom
Percent of activity per class					
Teacher substantive presentation	12.0	13.1	25.5	28.9	21.0
Classroom interaction[a]	19.8	0.0	0.2	0.2	5.4
Individual work	29.7	59.8	42.7	40.6	34.1
All drill activity[b]	24.7	18.1	20.5	16.4	17.1
Procedural information	9.3	7.2	7.3	9.7	10.9
Equipment adjustment	0.0	1.0	0.9	1.0	0.0
Nondesignated activity	4.5	0.8	2.9	3.2	11.5
	100	100	100	100	100
Frequency of interaction per class					
Closed-ended question	14.0	17.4	30.1	26.8	15.9
Open-ended question	35.2	0.0	0.5	0.8	28.0
Questions about understanding	47.6	9.8	8.8	12.5	36.2
Procedural questions	13.8	12.7	22.9	8.1	20.0

[a]Predominantly classroom discussion, this category also includes face-to-face interaction involving students.

[b]Predominantly substantive drill, the category also includes drills and quizzes.

then 40.6 in the following rounds. The teachers devoted 34.1 percent of conventional class time in spring 1977 to individual work, so there was a difference between the two teaching environments, but it was acceptable. The proportion of cable class time devoted to substantive presentation correspondingly increased from 13.1 percent to 25.5 percent in fall 1976, and to 28.9 percent in spring 1977. Similarly, by spring 1977 the same teachers had also increased the time spent lecturing in the conventional class (21.0 percent) over the first conventional class (12.0 percent).

The interaction record also shows consistent changes. The number of procedural questions shot up in fall 1976 as the teachers pressed students in the individual work periods, asking them if they had finished their assignments. It then dropped, in spring 1977, when they sought to encourage students to finish up by staying on camera in these periods and using visual cues that they were ready to proceed. Open-ended questions were possible during telephone calls, which occurred an average of once every other day. Most important, the teachers were able to increase use of the polling terminals. The number of closed-ended questions asked of the cable students rose from 17.4 per class in spring 1976 to 30.1 and 26.8 in the subsequent classes.

The experimental series seems to have allowed the teachers to improve their use of both environments. Perhaps because of the diagnostics and because all participating students responded to each question on the cable—rather than to one or two in a classroom—the teachers had a good sense of contact with their cable students. The teachers asked the class about their understanding of the material three to four times as often in the conventional classroom as they did on the cable. Less time was wasted on nondesignated activities on the cable (outside school personnel interrupting the class, a fire drill, or unrelated discussions of the weather, for example), but some of this time adds to the rapport between teacher and student. The electronic classroom that relies on polling terminals for student interaction has its weaknesses, but there were some compensatory strengths.

OUTCOME MEASURES

Because the design permitted students to self-select into conventional and cable classes, the research had to use a pretest-posttest design. It was possible that the two groups might not be comparable, and special attention had to be paid to the choice and interpretation of measures of instructional success to deal with this problem.[13] A pretest was deemed necessary to judge treatment group comparability and then allow analysis of gain or to act as a covariate to control for initial between-group differences. In the end, though, the choice of appropriate measures of student achievement depended on compatibility with both statistical and program requirements.

The current testing procedures at TEC rely on two tests. Any adult enrolling in Spartanburg TEC courses first takes the *Test of Adult Basic Education* (TABE).[14] The TABE has been found useful as a diagnostic test, locating the level of instruc-

[13] Attitudinal questions assessing level of motivation on entry and measures of group characteristics such as race, age, and sex were available only in the last round of the experiments.

[14] Ernest Tieges and Willis W. Clark, *Test of Basic Adult Education*, McGraw-Hill Book Company, Del Monte Research Park, Monterey, California, revised 1967.

tion at which a student should begin. For students in basic adult education, a second form of the TABE is available for retesting. For students completing the GED courses, Form 5 of the Iowa Test of Basic Skills (ITBS) is used as a posttest.[15] The ITBS is used as a screening device, and students attaining a score with a predicted probability of success on the GED test of 80 percent or more are recommended to take the state-administered General Educational Development test.

A review of the literature and discussions with researchers and practitioners in the adult basic education field led to the identification of only four tests that are considered valid measures of the achievement of adults preparing to take the GED. Two of these were the TABE (level D) and the ITBS (Forms 5 and 6). However, although these two tests have been useful to the TEC instructors in diagnosing student deficiencies on the one hand and estimating student probability of passing the GED exam on the other, they offer analysis problems suggesting the need for another test to evaluate student progress as a function of instructional mode. The TABE and ITBS do not have common, standardized indices for translating the scores of one into scores of the other, so the tests used in Spartanburg could not be used as pretest-posttest measures of educational achievement. The poor reliability and likely ceiling effects of TABE also made it an undesirable candidate for a pretest-posttest measure or a covariate. Similarly, the perceived difficulty and probable floor effects of the ITBS precluded its being an adequate measure. Although a third test, the Iowa Test of Educational Development (ITED:Forms X-5, Y-5)[16] showed good reliability coefficients and good prediction to GED, it suffered the possibility of floor effects and the risk that it may intimidate new students at pretest.

The fourth test, the Adult Basic Learning Examination (ABLE: Level III)[17] met enough of the essential technical criteria to be chosen as the pretest-posttest measure in the present experiments. It possesses good split-half reliability coefficients, uniquely has norms established on adult populations, is not likely to show floor or ceiling effects, and is a reasonably good predictor of GED scores. (See Table 8 for a comparison of all four tests on such technical considerations.) However, in light of their familiarity with the TABE for diagnostics and placement, and the ITBS for screening for the GED, the Spartanburg staff also continued to use the TABE at program onset and the ITBS at program completion.

RESULTS

The small sizes of the cable ($\bar{X} = 10.5$) and conventional ($\bar{X} = 16.8$) classes forced a consideration of pooling the data. Losses of data because students dropped out during the course or because it was not possible to schedule either pretests or posttests for them further reduced the number of students with gain scores on the ABLE. Because the pre-GED class involved different level students and a different curriculum, it was set aside. Then we considered four criteria to see if pooling the

[15] A. N. Hieronymous and E. F. Lindquist, *Iowa Test of Basic Skills*, Houghton Mifflin Co., Boston, 1971.

[16] E.F. Lindquist and L.F. Feldt, *The Iowa Tests of Educational Development*, Science Research Associates, Inc., Chicago, 1960.

[17] B. Karlsen, R. Madden, and E. F. Gardner, *Adult Basic Learning Examination*, Harcourt Brace Jovanovich, Inc., New York, 1972.

Table 8

RATINGS ON CRITERIA FOR ACHIEVEMENT TEST SELECTION

	Technical Attributes					Programmatic Compatibility		
	Areas Tested	Split-half Reliability Data	Established Adult Norms	Floor or Ceiling Effects	Appropriate for Assessing GED Readiness	Possibility of Intimidating New Students at Pretest[a]	Diagnostic Potential at Pretest[a]	Approximate Administration Time
ABLE Level III	Vocabulary Spelling Reading Arithmetic	Students: Grades 10,12 92% of the 12 subtest reliability scores ⩾ .85	Yes	Unlikely	Yes $R^2 = .60$	would probably not intimidate	not useful for diagnosis or placement	3½ hours
ITBS Forms 5 and 6 Level 14	Vocabulary Reading comprehension Work-study skills Mathematics skills	Students: Grade 8 80% of the 15 subtest reliability scores ⩾ .85	No	Floor effects likely at pretest	Yes $R^2 = .73$	very likely to intimidate	not useful for diagnosis or placement	4 hours
ITED Forms X-5, Y-5	Reading comprehension Vocabulary Language usage Spelling Mathematics Social studies back-ground Science background Use of sources	Students: Grades 9-12 97% of the 88 subtest reliability scores ⩾ .85	No	Floor effects likely at pretest	Yes $R^2 = .77$	very likely to intimidate	not useful for diagnosis or placement	3½ hours
TABE Level D	Reading Arithmetic Language Spelling	No acceptable reliability data available[b]	No.	Ceiling effects likely at posttest	No	unlikely to intimidate	established as diagnostic tool	3 hours

[a]These ratings are based on judgments of both the Spartanburg TEC instructors and other experienced Adult Basic Education professionals.

[b]Developers of the TABE claim that this instrument has inherited its reliability from the California Achievement Test (CAT) from which the items were drawn. The inadequacy of this reasoning for establishing instrument reliability is discussed in Oscar K. Buros, *The Seventh Mental Measurements Yearbook*, Gryphon Press, Highland Park, N.J., 1972.

three GED classes was advisable: (1) comparability of treatments across time; (2) comparability of subject background characteristics (e.g., sex, race); (3) comparability of initial knowledge levels of subjects; and (4) comparability of other experimental conditions (e.g., teachers and material). Table 9 shows the results of some of these comparisons.

Table 9

INITIAL COMPARABILITY OF GED CABLE STUDENTS

	Round 1 Spring 1976 (N = 24)	Round 2 Fall 1976 (N = 21)	Round 3 Spring 1977 (N = 37)
Sex (percent female) ($\bar{x}$=75.6)	79.2	71.4	75.5
Race (percent black) ($\bar{x}$=18.3)	12.5	23.8	18.9
ABLE pretest percentile scores			
Vocabulary	50.32	44.78	42.63
Reading	53.23	54.56	48.80
Computation[a]	27.95	22.67	42.43
Problems	36.18	33.67	36.54
Spelling	53.82	53.11	50.29

[a]F test for difference in means of three rounds is significant at .060 level.

All experimental rounds received the same instruction and all used the data terminals. Although the telephone was used in class after the first round, the observation instrument shows that it was used for less than a minute a day (Table 7, above). The students in the three rounds were somewhat similar on the only background data that are available: on average, 75.6 percent of the subjects were female, and 18.3 percent were black. Similarly, on initial knowledge as measured by ABLE, all three GED classes are comparable except on the computation subtest, where the third round subjects appeared to excel. In the second round, the cable class was held in the evening rather than the morning, but that did not seem to change the basic makeup of the students. Data on the cable classes could therefore be pooled. The conventional class in round two was the only one taught by different teachers,[18] and gain scores were neither collected nor pooled from this student group. The GED analysis is thus based on a comparison of three cable classes and two conventional classes.

There is a potential danger that self-selection factors would lead different types of students to go into cable and conventional classes. For example, perhaps only those students who could not come to TEC for classes or who did not want a classrooom experience agreed to participate in the cable group. If these reasons relate in any systematic way to student receptivity of the curriculum material, then unmeasured bias has been introduced. To determine whether this possibility should qualify an interpretation of student gain scores, the first step in the analysis was

[18] The teachers employed through all three rounds were teaching a cable pre-GED class, a conventional pre-GED class, and the cable GED during the second round. To add a fourth class would have meant too many class hours a day for these instructors.

to examine the initial comparability of the two treatment groups. Table 10 presents the results of comparisons on sex, race, dropout rate, and pretest performance on the ABLE. All differences between the two conditions are nonsignificant, except one; on the computation subtest of the ABLE, cable students performed significantly worse than conventional students at pretest. Thus, there seems no reason to suspect any systematic differences between subjects in the two groups that would bias the experimental results.

Table 10

INITIAL COMPARABILITY OF TWO CONDITIONS

Variable	Cable Students	Conventional Students	All Students
Sex (percent female)	78.8	76.3	77.5
Race (percent black)	21.2	10.5	15.5
Dropout rate	18.2	10.5	14.1
ABLE pretest percentile scores			
Vocabulary	42.2	48.0	45.5
Reading	45.6	55.4	51.1
Computation[a]	23.6	43.8	34.9
Problems	30.6	40.3	36.0
Spelling	49.9	53.4	51.8

[a]$F_{df=1,64} = 9.46, p < .01.$

The results of one-way analyses of variance (ANOVAs) for the treatment differences in gain score on each of the five ABLE level III subtests are presented in Table 11. Using percentile measures of student achievement, we can express gains in terms of the mean percentile increases across the three GED rounds. Only one subtest, vocabulary, shows a gain in the cable group sufficient to reject the hypothesis that student achievement in the groups is "the same," and that gain suggests that the cable class performed better, not worse, than the conventional class. Only in spelling did the cable class not advance as much as the classroom students. The extent of that difference is not sufficient to conclude there is indeed any difference, however, even using a one-tailed test and an extended rejection region. But if one cannot conclude that the cable students did significantly better, it is safe to conclude that the cable instruction was no worse than classroom education for these GED students.

The story is somewhat different for the pre-GED classes. This component of the experimental series was intended to test the feasibility of the interactive television instruction for a less-educated population and the potential for a program of education carrying the student from the basic level through a GED degree. As in the GED round, student achievement was measured by the ABLE. Level II was administered at pretest—with scores translated into equivalent level III scores—and level III at posttest. As Table 12 reveals, interpretation is made more difficult by apparently negative gain scores, possibly resulting from bias in the method provided by the ABLE guide for translating the tests into comparable scores. Cable students perform no differently than conventional students on the computation and spelling

Table 11

GAIN SCORES ON ABLE FOR GED STUDENTS BY CONDITION

Subtest of ABLE	Condition: Conventional (N = 21)	Condition: Cable (N = 21)	Significance Level of F[a]
Vocabulary	7.38	16.14	.08
Reading	18.33	19.00	.93
Computation	25.33	27.95	.75
Problems	12.67	16.81	.50
Spelling	10.38	5.38	.22

[a]Rather than testing whether the groups are different, the purpose behind the research seems better served by asking whether interactive cable instruction is "no worse" than conventional instruction. This logic implies that we must use a one-tailed test, because we can conclude that cable instruction is effective, and be unconcerned so long as cable students do either as well as or better than conventional students. This one-tailed test could be made more conservative to "protect" future cable viewers from risk of poorer performance by extending the rejection region from $p = .05$ ($t = 1.64$) to one standard deviation below mean equivalence ($t = 1.00$) or $p = .16$.

Table 12

GAIN SCORES ON ABLE FOR BASIC ADULT STUDENTS BY CONDITION

Subtest of ABLE	Condition: Conventional (N = 8,9)	Condition: Cable (N = 8)	Significance Level of F[a]
Vocabulary	- 1.33	8.75	.14
Reading	4.22	- 9.63[a]	.15
Computation	33.89	25.75	.54
Problems	- .75	-14.63[a]	.17
Spelling	21.63	25.63	.72

[a]The posttest scores in the two conditions were the same on (at least) the reading test (average score in the conventional class was 22.89; the average score in the cable class was 23.62). The declines in performance may be related to testing conditions or measurement artifacts.

subtests. Where there are differences, the direction varies and the magnitude of the differences could have occurred by chance. The safest conclusion is again that there are no significant differences between the two modes of instruction.

Because of the small sample size (overall N = 17), one must take these findings very tentatively. For these pre-GED students, the road to a high school equivalency degree is much longer, and the face-to-face contact in the conventional classroom may play an important motivational role. On a positive note, however, 70 percent of the cable class, compared with 58.8 percent of conventional classroom pre-GED students, showed sufficient motivation to continue their education by enrolling in the GED classes the following semester.[19]

CONCLUSION

The effectiveness of interactive cable television as an instructional medium for (at least) GED-level education has been documented: Clearly cable students fare no worse for missing the social environment of a conventional classroom, and certainly home cable classes have provided the only acceptable means for finishing high school for some students. The only disappointment was the small turnout for cable classes. As noted above, this result raises serious questions about the market for adult education programming on cable television and will be systematically addressed in Sec. V.

The real success of the adult education program may not be measurable. For instance, one of the first cable class graduates is now enrolled in a local college to receive training in daycare and has already been placed in a job at a daycare center. Another cable graduate, uninterested in or perhaps intimidated by the prospect of returning to a conventional classroom, has now been promoted to a job for which a high school degree was required. Another is taking college-level courses at TEC and has voiced her pride in her achievement on national television. Still another successful student reports that she now reads the employment section of the classified advertisements just for the pleasure of seeing how many jobs require a high school education. Individual success stories—better jobs, better opportunities, pride and confidence—are difficult to quantify in experimental group comparisons, but are potent nonetheless.

[19] Three of the seven continuing cable students did well enough to be recommended to take the GED, and two passed. Six of the ten continuing conventional students were recommended, and two passed.

IV. CONTINUING EDUCATION AND THE TELEPHONE ALTERNATIVE

When one debates the future of home interactive education, the potential benefits for the educationally disadvantaged are only one concern. The usefulness of a system for average or well-to-do citizens who wish to extend their education must also be considered. This latter group represents the main commercial market for interactive education programs because it includes current cable subscribers and those who might subscribe if educational programs were put on cable. When cable operators consider the installation of interactive service, this paying population is naturally their primary interest.

Before committing substantial capital, the cable industry will want to know whether subscribers will pay for, learn from, and be satisfied with interactive systems of home education. That returns us to the questions of market and educational effectiveness, but for students who have different characteristics. Because many of these adults have strong educational backgrounds and are more positively oriented toward education, they may not require as much interaction.

Most homes already have an "interactive terminal" supplied by the local telephone company. Before a cable operator invests in a return cable capacity and before the federal government requires such a capacity because of its educational potential, one should consider the telephone's potential role. The GED adult education programs found that students were very reluctant to initiate calls during the program, and the telephone played a valuable but only supplementary role. But would better-educated populations feel that reluctance, and can the telephone be used as the primary interactive device?

The literature on the future of cable education includes examples of everything from professional seminars to entertaining diversions. Professional courses, college-accredited programs, and training programs aimed at maintaining or upgrading a student's job skills or credentials are certainly a rich market. One community survey found that over half of those definitely interested in college courses on the cable gave an occupational goal as the first reason for that interest, and two-thirds would want credit toward certification or a degree.[1] This type of student is likely to be quite motivated and would certainly be a prime market for home cable education.[2]

The role of cable for noncredit education is more problematical. On one hand, the motivating factors are less strong, and it may be more important to have an interactive capacity if the courses are to be successful. On the other hand, little is known about the determinants of student satisfaction with courses on microwave cooking, consumer economics, flower arranging, and do-it-yourself plumbing. Community colleges around the country offer such courses to hundreds of thousands each year, but can such courses be effective over the cable? The Spartanburg

[1] B. Wallace, *Continuing Education by Cable Television: A Market Survey and Guidelines for Action*, Ed.D. dissertation, School of Education, University of Pittsburgh, 1976.

[2] The same survey found that one-sixth of the respondents (subscribers of the Meadville Master Antenna Cable television system in northwestern Pennsylvania) were both definitely interested in college courses *and* would like television as part of a home study program. Ibid., p. 89.

project chose parent education as an illustrative course to explore that question because it addressed an apparent need in Spartanburg and because it was a non-credit course for the most part *not* directed toward occupational advancement.

PARENT EDUCATION NEEDS AND PROGRAMMING

A great deal of attention has focused on daycare as an important social mechanism, freeing women to enter the world of work and broadening the child's exposure to developmental programs. The need for better center-based care led the project staff to choose in-service training of caregivers in daycare centers as the means of testing two-way video programming. The results of that experiment are reported elsewhere.[3] It was evident, however, that the majority of the children in Spartanburg would not be affected by improvements in daycare centers.

Despite the growth of daycare arrangements over the last decade, the primary mechanism of care in this country is the mother taking care of her own children at home. In over two-thirds of two-parent families with children under age 6, the mother is unemployed. Of the mothers who are the only parent of children under age 6, almost one-fourth are unemployed.[4] In these families, the burden of helping a child's social, emotional, and cognitive development falls almost entirely on the parent. And even parents who have daycare arrangements outside the home still are, after all, the primary caregivers for their children.

Programs have been established to bring to parents a better understanding of child development and to teach them how to apply that knowledge to child-rearing practices. For instance, the Office of Child Development in DHEW has been operating Parent-Child Development Centers to improve the child-rearing skills of mothers from disadvantaged areas. Strong evaluation measures reveal that the Birmingham, Houston, and New Orleans programs have had positive effects on parent-child interactions and have led to subsequent increases in the social, emotional, and cognitive skills of the children.[5] In another initiative, the Ypsilanti Carnegie Infant Education Project emphasized the goal of having mothers grow as teachers, and a subsequent home teaching project used videotaped mother-child interactions as a central learning device; both projects report in qualitative terms that the approach has been successful.[6]

Child development information is available in institutions of higher education throughout the country, but parents do not come forward in large numbers to enroll in such courses.[7] However, many in the daycare community in Spartanburg argued that parents were concerned and that if cable could carry the information to the

[3] See Sue E. Berryman, Tora K. Bikson, and Judith S. Bazemore, *Cable, Two-Way Video and Educational Programming: The Case of Daycare,* The Rand Corporation, R-2270-NSF, October 1978.

[4] *Current Population Survey,* March 1972 (analyzed by M. E. Robinson and R. M. Baecker, Office of Child Development, Department of Health, Education, and Welfare, Washington, D.C., 1974).

[5] Department of Health, Education, and Welfare, Office of Child Development, "Parent Child Development Centers," Description Status Report, April 1976.

[6] D. Z. Lambie, J. T. Bond, and D. P. Weikart, *Infants, Mothers and Teaching: A Study of Infant Education and Home Visits,* High/Scope Educational Research Foundation, Ypsilanti, Michigan, 1974.

[7] When questioned in February 1978, J. Hatcher, Director of Early Childhood Program, Spartanburg Methodist College, and B. Ebert, Office of Graduate Education, University of South Carolina Spartanburg Regional campus, observed that nearly all students in early childhood courses are working toward degrees, recertification, or teaching aide positions. Some of these students are of course parents, and a few parents in other programs enroll in early childhood electives, but the numbers are very small.

home, they would participate. We thus had a perceived need for noncredit continuing education and evidence that parent education has had results in other contexts. Parent education was therefore selected to test the value of interactive terminals and the telephone for home education.

The Spartanburg parent education programs were used to explore the effectiveness of interactive terminals for general cable subscriber populations in a context of widespread telephone availability. The design sought to isolate the marginal utility of data terminals above and beyond the use of the telephone. The first round was conceived of as more or less a pilot experiment. It was an opportunity to get into the field with a curriculum loosely organized to address the information needs of parents in order to: (1) gain some sense of the market for and reception of the curriculum; (2) focus and refine the content of that curriculum; (3) field test and revise the measures and indices of knowledge acquisition developed for these experiments; and (4) structure the analytic questions about the curriculum and the technology to be addressed in both experiments. The second round permitted more rigorous analysis of the role of the telephone and data terminals in this type of parent education. Both rounds provided insight into the market for continuing education using interactive home terminals.

Program Content

The broad themes of the curriculum drew from the same psychological literature that has been used in many such programs. Unlike GED experiments, there was no established curriculum or standardized national test in this field, so it was necessary to develop the course content and evaluation measures. The first requirement was to make explicit the propositions to be taught and the method of presentation. Much of the experience of the earlier daycare experiment could be easily carried over; and it aided the staff in organizing, scheduling, and presenting the curriculum. In addition, the organizer and primary instructor of the daycare workshops was available to continue in that role in the parenting experiment.

Much of the curriculum was derived from the broad body of literature based on the work of Piaget. Although Piaget's work concerning the cognitive development of children has perhaps had its greatest influence on the development of formal curricula for early childhood education,[8] many of his theories apply in a practical way to parents rearing young children at home. The content of the parenting programs was designed to present a framework for application of Piagetian principles to both the parents and the caregivers in the sample. The purpose of these programs was to convey three types of knowledge about developmental sequences in childhood: (1) a general knowledge of developmental stages; (2) specific knowledge of the characteristics of the stages; and (3) knowledge of means by which principles of development can best be applied.

The curriculum was based on an elaboration of six basic principles. Four describe the major features of a Piagetian theory of cognitive development:

- Intellectual development occurs in an invariant sequence of stages.

[8] See, for example, C. Kamii, "An Application of Piaget's Theory to the Conceptualization of a Preschool Curriculum," in R. K. Parker (ed.), *The Preschool in Action*, Allyn and Bacon Inc., Boston, 1972.

- Each stage in the development of intelligence is characterized by the presence or absence of specific cognitive operations.
- The child develops physical, social, and logico-mathematical knowledge during each stage.
- The child's active construction of knowledge occurs in his confrontations with his physical and social environments.

Our previous experience with training for daycare center staff and contacts with parents in the community revealed additional concerns with language and socio-emotional behavior. Consequently, two other principles were incorporated into the curriculum:

- Language involves the representation of individual objects and of physical, social, and logical knowledge.
- To the degree the child is forced to behave in response to external controls, he will not be able to develop internal controls.

An elaboration of these principles is found in App. A.

Program content in the first and second experiments was essentially the same; any changes were shifts more in emphasis than in content or form. For instance, the second experiment curriculum content explored the Piagetian principles in depth and included a study of the Piagetian vocabulary of cognitive development. A review of research into the effect of childhood experiences on cognition and a study of operations other than conservation in the concrete operational stage were also added. Programs dealing with language development were expanded to include both the Piagetian theory of representation and a study of the stages and operations of language development as they approximate and illustrate the stages in the development of cognition.

The most extensive revision of program content was made in the area of socio-emotional development. The first or pilot experiment dealt with a general approach to behavior based on Piaget's study of the development of respect for rules. The second experiment distinguished between Piaget's work on moral development and the work of such theorists as Erikson, who deals largely with socio-emotional development as it is displayed in feelings of trust, autonomy, and initiative.[9] The program emphasized the need to understand that certain behaviors that appear anti-social are to be expected in childhood and that the child's cognitive and socio-emotional development are not always at the same stage at the same time.

Program Format

In both the pilot and the subsequent experiment, 36 hours of instructional programming were presented. The hours were from 1 to 2 p.m., three days a week for 12 weeks. The first programs were presented on Tuesday, Wednesday, and Thursday from September to December 1976. In the second round, the programs were presented on Monday, Tuesday, and Wednesday from January to May 1977, a scheduling change made to facilitate maintenance of the technical system.

Presentation of all the principles involved a variety of methods such as lecture/discussion, quizzes, films, demonstrations, programmed material, and interactive

[9] E. H. Erikson, "Identity and Life Cycle," *Psychological Issues*, Vol. 1, No. 1, Monograph 1, 1959.

problem solving, with an emphasis on the interpretation of Piaget's theory of cognitive development. The general format was a combination of classroom and workshop techniques: An overview of one of the principles was presented by lecture or discussion, followed by a short quiz; subsequent programs enlarged upon the principle and demonstrated ways it could be applied. For example, the principle, "each stage in the development of intelligence is characterized by the presence or absence of specific cognitive operations," was introduced by a lecture and a quiz, followed the next day by a film, "The Growth of Intelligence." The next three programs presented the cognitive operations specific to the three stages, and the program leader demonstrated tasks appropriate to each stage. For example, there was a review of the tasks related to physical concepts of length that a child could be expected to perform at a certain stage of development. Frequently during this demonstration period, the participants were engaged in creating games and other devices for particular learning experiences. Emphasis was placed on use of common household objects to provide these experiences. (In the pilot, the materials actually used in this "workshop" approach were provided as a part of the recruitment incentive.)

An average of five hours (or five programs) was spent in introduction to and elaboration of each principle. Other programs were spent in introducing the participants to the technical system and orienting them to the procedures involved and in exploring and reviewing all the principles as they interrelate and reinforce each other.

Although the pilot program format was a balanced combination of classroom and workshop approaches, the second experiment emphasized the classroom approach. This shift in format occurred largely because of differences in the characteristics of the participants in the second experiment. One-half of the sample for the pilot experiment were employed caregivers with less formal educational background and with an expressed interest in practical application of theory. All participants in the second experiment were parents, two-thirds of whom were college graduates.

MEASURES

Given the three types of knowledge around which the curriculum was developed and organized, we expected changes in the participants' knowledge congruent with these categories. That is, at program completion, subjects were expected to show a better appreciation of developmental differences in a child's cognitive abilities, an understanding of the specific limitations restricting performance of and skills available to a child of a certain age or developmental level, and an ability to apply knowledge about general structural characteristics and specific skills to an age-appropriate structuring of learning situations for the child.

The measures developed to test changes in the three types of knowledge represented in the curriculum were designed to be appropriate to a parent as well as caregiving audience. Three measures of change were used in the two experiments: (1) the Cartoon Booklet, (2) the Situations Booklet, and (3) the Developmental Stages instrument (see App. B.)

The *Cartoon Booklet* format was adapted from the daycare workshop experiment with daycare centers,[10] with the deletion or modification of center-specific items and the addition of parent-appropriate items. In the Cartoon Booklet, a story or situation involving a parent or caregiver interacting with children of varying ages or with other parents or caregivers is created in three cartoon frames (see Fig. 12 for a sample story). Then three different frames are presented as possible solutions or endings to the situation depicted. The subject's task is to select the frame that best completes the situation—i.e., that most clearly describes what the subject would do or what conclusion should be drawn in such a situation. (Cartoon stories were grouped by the age of the children relevant to the situation and to the choice of action.)

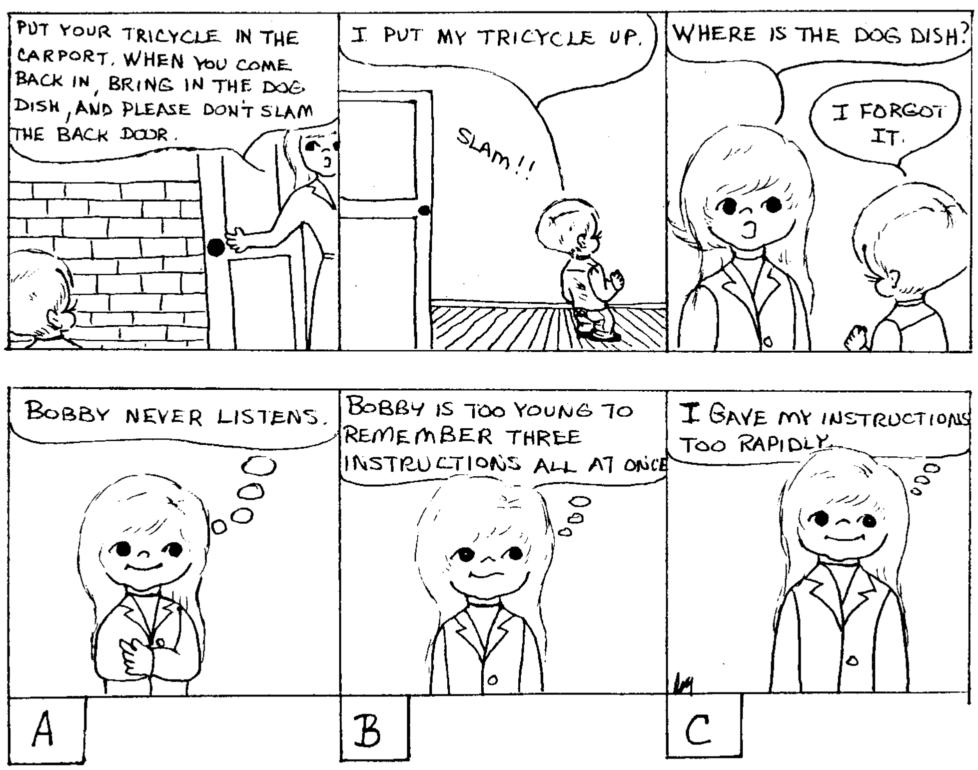


Fig. 12—Example of item from cartoon booklet

This booklet was originally designed as a means of testing, with measures involving minimum verbal skill, a population presumed to be without much formal education and unaccustomed to testing situations. The items set up fairly simple, straightforward, everyday caregiving situations. Although able to tap understanding of basic developmental and teaching principles, they are not in format like standard knowledge exams, which are often imposing and threatening.

[10] In Berryman, Bikson, and Bazemore, Sec. V.

The *Situations Booklet* contains items describing mother-child interactions and requiring responses that take into account what child or adult behavior is appropriate for certain age children. The booklet was developed specifically for the parenting experiments. Relying on a verbal format, the Situations Booklet allows more specific questions about developmental sequences in a child's cognitive skills (e.g., identifying the relative development shown by different children's performance on classification tasks), about Piagetian concepts and principles relevant to assessing a child's progress (e.g., seriation, conservation), and about methods for dealing with children that appreciate their stage of development (e.g., explaining time intervals). The instrument is for identification of specific Piagetian concepts and the ages at which certain cognitive operations could be expected to appear.

To more adequately represent structural knowledge and the curriculum's emphasis on developmental milestones, the *Children's Developmental Stages* instrument was developed at posttest of the pilot. This instrument requires specification of ages (or age ranges) characteristic of certain developmental stages and skills. (Figure 13 is an example of an item, with an appropriate response indicated, from this instrument.) For each of 15 items describing a behavior and displaying a scale ranging in age from newborn to 9 years, the subjects are asked to indicate the age or age range for which the behavior described is typical. Correct responses were those indicating ages within the appropriate developmental stage (i.e., sensory-motor, preoperational, or concrete operational) and not theoretically too young for appearance of the behavior indicated. As with the two previous instruments, this measure keeps stimulus and response mode simple and straightforward and addresses the curriculum material directly.

The child is able to watch something being changed and is able to imagine how to return it to its original state.

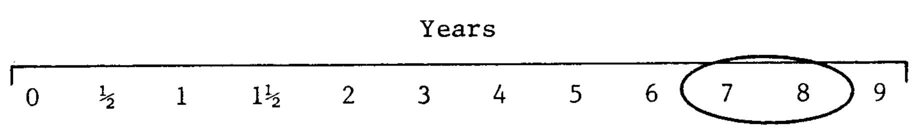


Fig. 13—Example of item from Developmental Stages instrument

SCALE CONSTRUCTION

Following the goals of the curriculum concerning knowledge about developmental sequence in childhood, the measures testing it may be organized into the following categories:

1. *Structure:* Ability to identify general stage characteristics as opposed to specific operations within a stage;
2. *Operations:* Ability to recognize specific operations (e.g., object permanence, conservation, classification, correspondence, seriation) occurring within stages; and

3. *Application:* Ability to use developmental principles to enhance a child's progression through stages.

Each test item was assigned to one of these three domains as a basis for three indices to measure change. Scores then represent the total number of correct index items. Although the basis for this item assignment was theoretical, empirical support was sought in the pilot data to assure that items coalesce statistically as well, to identify and delete any anomalous items, and to define outcome batteries for the second experiment. The correlation matrices for the knowledge index items (pilot posttest only) in general added credence to the theoretical clustering of items. Most items showed a significant ($p < .05$) correlation with total index score and with at least some other items within the index.

Negative correlations were examined carefully, for they might indicate a unique item tapping information unexpectedly negatively related to the underlying theoretical dimension(s) of interest and thereby serving to wash out detectable effects of the treatment. However, with the number of correlations calculated per knowledge scale, a certain number of negative correlations can be expected to be reported as significant merely by chance. Therefore, only items showing consistent patterns of negative correlations were sought for elimination.

The criteria used for dropping items from an index were the following: (1) The item was negatively correlated with two or more other items on the index; (2) the item was positively correlated with no more than two other index items; and (3) the item was uncorrelated or negatively correlated with at least one of the total index scores (i.e., the full posttest battery of items or only those items common to both the pretest and posttest). By these criteria, six items were dropped from any further analysis in the knowledge indices. An explanation of the failure of these particular items to fit is not obvious from their content; perhaps it lies in some unanticipated interpretation of the wording of the items and their response alternatives or some lack of congruence of the item with the presentation of the concept by the curriculum. The initial item assignments and a summary of the relationships among retained items on the three indices are presented in Tables B.1 and B.2. These revised indices then defined the batteries on which outcomes in the pilot and the second experiment were analyzed.[11]

PILOT EXPERIMENT

The design of this experiment included two conditions: (1) telephone return—participants receiving one-way transmission of the workshops and having the op-

[11] Additional revisions of the scales were based on ceiling effects. Items that everyone or nearly everyone in one treatment group but not the other gets correct at pretest are potentially problems for estimating differential effects of treatment. If one group is initially at ceiling on an item, then that group has little or no room for improvement, and its gains, if any, at posttest will thereby compare poorly with any gains made by the other group. However, if both groups do well on an item at pretest, although both have little room to move, the item can only add stability to the total index score by increasing the number of items on which the index is based. If 75 or more percent correct is used as the criterion for identifying items at ceiling (allowing movement of only five phone or five data subjects), then only one item used to measure gain (i.e., an item common to pretest and posttest) was at ceiling in one of the groups and not in the other. That item was dropped from analysis of the pilot data. This elimination was temporary; consideration of ceiling effects and elimination of appropriate items was done anew for the second experiment. With a similar criterion (70 percent or more correct) for ceiling, three items were dropped from analysis of those data.

portunity to telephone in comments and questions on the workshops during or after the program, and (2) telephone with data return—participants in an identical situation with the addition of a simple 8-button data terminal in the home or center. The terminal allowed the viewer to send return signals to the workshop instructor to answer multiple choice questions and to convey limited messages about the content and pace of the program. No control group was included in the design. Therefore, overall gains as a result of the curriculum presentation must be determined through change scores. However, without a control group, no estimation of history, Hawthorne, or testing effects are possible, and therefore none of these effects can be fully disentangled from gains.

An effort was made to randomly assign subjects to one of the two conditions,[12] but with pragmatic constraints on recruitment, the chance variations that can occur in small samples and other factors nonetheless led to group differences. As Table 13 shows, there was an uneven distribution of participants to condition within role (i.e., parent or caregiver).[13]

Table 13

DISTRIBUTION OF SUBJECTS IN PILOT EXPERIMENT BY CONDITION AND BY ROLE

	Role of Subject		
Condition	Parent	Caregiver	Total
Telephone alone	12	6	18
Data and telephone	6	13	19
Total	18	19	37

On average (see Table 14), the caregivers in the sample were several years older than the parents (40.1 years vs. 31.6 years). Subjects in the telephone group were only slightly older than those in the data group (36.8 years vs. 35.2 years). All six blacks in the sample were caregivers; they constituted 31.6 percent of the caregivers, and were evenly distributed across conditions. The concentration of caregivers in the data group caused serious problems because the parents in the sample appeared more educated than the caregivers. All parents had at least a high school education; 61.1 percent were college graduates. Among the caregivers, 31.6 percent had not finished high school and an equal 31.6 percent were college graduates. If educational level indicates ability and willingness to learn or can be expected to interact with the treatment and influence the amount of learning, then differences in educational background may be expected to produce different results on measures of cognitive gain from the curriculum.

[12] Some parents and caregivers for convenience watched the workshops in groups. However, the group arrangements were made ad hoc, without experimental control, and the resulting zero-frequency cells made consideration (in data analysis) of the potential influence of such arrangements impossible.

[13] Because inclusion of one center in the data condition meant the addition of seven caregivers, the caregiving data group immediately doubled. This inflation of the total data group resulted in compensatory inflation of the telephone group, which, with the limited number of caregivers available, meant additional parents.

Table 14

DISTRIBUTION BY CONDITION AND ROLE OF SELECTED RESPONSES TO INFORMATION FORM—PILOT EXPERIMENT

	Condition		Role	
Variable on Form	Telephone and Data (n = 19)	Telephone Alone (n = 18)	Parent (n = 18)	Caregiver (n = 19)
Age (years)	35.2	36.8	31.6	40.1
Race (percent white)	78.9	88.9	100.0	68.4
Education (percent college graduates)	31.6	61.1	61.1	31.6
Percent having child-care related degree	5.3	16.7	11.1	10.5
Percent having child-care related courses	61.1	83.3	77.8	63.2
Goals for children				
Number mentioned	1.6	1.7	1.7	1.6
Percent mentioned social development	73.7	88.9	83.3	78.9
Percent mentioned emotional development	42.1	50.0	61.1	31.6
Percent mentioned school preparation	31.6	27.8	22.2	36.8
Percent mentioned custodial care	15.8	0.0	0.0	15.8
Percent who knew other participants	84.2	77.8	94.4	68.4
Number of others known	5.2	3.8	3.9	5.1

These and other differences between groups make simple analysis of any difference in gains in the two conditions unwise. The telephone group contained more parents, and the parents attracted to the program were younger and better educated than caregivers in the sample. These factors, indicating initial differences in socioeconomic status and potential learning capacity between treatment groups, could operate to the favor of the telephone group for reasons having nothing directly to do with the effect of treatment (i.e., telephone vs. data communications). Therefore, any analysis of relative group gains from the curriculum must take into consideration these initial differences and control for them statistically where possible.

Two methods of testing for change as a result of the curriculum as well as condition of reception of the curriculum are appropriate: (1) two-way ANOVA for repeated measures (condition by time of testing), which tests for gain by taking into account pretest status in judging posttest status; and (2) ANCOVA, which statistically controls not only for pretest status on outcome measures but for background differences on such characteristics as age, race, and education, adding precision to estimates (and sources) of change. The first method provides an important estimate of overall gain over time, the second a more precise estimate of treatment differences.

The mean scores for the three knowledge scales by condition and time of testing are presented in Table 15, and the results of the ANOVA for repeated measures are provided in Table 16. As evidenced in Table 15, few items make up the indices, because only items common to pretest and posttest were used. Table 17 presents the results of the ANCOVA. Two things are clear from the two analyses: There were

Table 15

MEAN NUMBER OF ITEMS CORRECT BY TYPE OF KNOWLEDGE, CONDITION, AND TIME OF TESTING

Condition	Time of Testing	
	Pretest	Posttest
I. Structure (6 items)		
Data and telephone	2.58	3.42
Telephone alone	2.78	4.17
Total	2.68	3.79
II. Operation (7 items)		
Data and telephone	3.89	4.15
Telephone alone	4.17	4.94
Total	4.03	4.54
III. Application (6 items)		
Data and telephone	2.05	3.16
Telephone alone	2.78	4.00
Total	2.42	3.58

Table 16

ANALYSIS OF VARIANCE RESULTS FOR EACH KNOWLEDGE INDEX

Source	SS	df	MS	F	p	% Total SS
I. Structure						
Condition (C)	4.12	1	4.12	1.63	n.s.	2.69
Subject within C	88.47	35	2.53	(a)		57.68
Time	23.00	1	23.00	22.12	.001	15.00
Condition x time	1.38	1	1.38	1.33	n.s.	.90
Time x subject within C	36.40	35	1.04	(a)		23.73
Total	153.38	73	2.10			100.00
II. Operations						
Condition (C)	5.18	1	5.18	1.48	n.s.	2.80
Subject within C	122.36	35	3.50	(a)		66.08
Time	5.01	1	5.01	3.41	.08	2.70
Condition x time	1.22	1	1.22	.83	n.s.	.66
Time x subject within C	51.40	35	1.47	(a)		27.76
Total	185.17	73	2.54			100.00
III. Application						
Condition (C)	11.35	1	11.35	4.13	.05	6.34
Subject within C	96.14	35	2.75	(a)		53.70
Time	25.04	1	25.04	18.87	.001	13.98
Condition x time	.06	1	.06	.05	n.s.	.04
Time x subject within C	46.45	35	1.33	(a)		25.94
Total	179.07	73	2.45			100.00

[a]Not tested.
n.s. = not significant.

Table 17

ANALYSIS OF COVARIANCE RESULTS, PILOT

Source of Variation	Structure $p\leqslant$	Operations $p\leqslant$	Application $p\leqslant$
Independent Variable			
Condition	n.s.	n.s.	n.s.
Covariates			
Pretest	n.s.	n.s.	n.s.
Race	.11	n.s.	.01
Education	.01	.002	.12
Role	n.s.	n.s.	n.s.
Age	n.s.	n.s.	n.s.
Total explained	.002	.001	.002
Multiple Adjusted R^2	R^2=.484	R^2=.515	R^2=.475

significant learning gains in both groups of subjects, and there was no difference by condition.

The significant gains in knowledge made over the time of the televised workshops are evident in both structure and applications ($p < .001$). The magnitude of the effects, however, can only be regarded as modest, as the main effect of time accounts for at most 15 percent of the variance in index scores.

There was no effect of condition on knowledge acquisition. The ANOVA shows a condition effect on the application index. However, the lack of any significant condition-by-time interaction suggests that on this index the higher educational level of the telephone group may have aided both the pretest and posttest performance; but neither treatment nor education led to differential improvement in posttest performance. In addition, the ANCOVA (Table 17) shows that when factors beyond pretest scores are statistically controlled for in the determination of treatment effects, not only does this treatment difference disappear, but the role of education (having at least a college degree) and race (being black) in that disappearance becomes obvious.

The pilot experience provided valuable information for the conduct of the second experiment. The differences in caregiver and parent background had complicated curriculum presentation and data analysis. To simplify both matters, the project staff decided to concentrate on parents in the second-round sample. The basic curriculum had now been given a field trial, and the response to it provided the means for its revision and refinement, particularly in areas of concern voiced by parents. The pilot also provided necessary field experience with the evaluation measures for the construction and validation of knowledge scales. The research staff carried out minor item revision and developed a new test, Developmental Stages. Most important, the pilot showed that cable instruction in parenting was feasible.

SECOND EXPERIMENT

The sample for the second experiment consisted of 32 females, all parents. (Four

caregivers were initially recruited as part of the sample, they received the programming, and most completed the data forms. However, given their small number and the substantial differences found between caregivers and parents during the pilot, these four women were excluded from any data analysis.) Subjects were randomly assigned to the telephone group (n = 17) or the data group (n = 15) as previously defined.[14]

The two groups of parents were strikingly similar on all the background characteristics explored (see Table 18). They all were white and on average 32 years old;

Table 18

DISTRIBUTION, BY CONDITION, OF RESPONSES TO PARENT INFORMATION FORM, EXPERIMENT 2

Variable on Form	Condition: Data (n = 15)	Condition: Telephone (n = 17)	Total (n = 32)
Age (years)	31.4	33.2	32.4
Race (percent white)	100.00	100.00	100.00
Education (percent college graduates)	73.3	64.7	68.7
Percent having child-care related degree	6.7	11.8	9.4
Percent having taken child-care related courses	86.7	76.5	81.3
Occupation (percent housewives)	86.7	76.5	81.3
Percent two-parent families	100.00	100.00	100.00
Age of husband	33.4	32.2	32.8
Percent of husbands with college degrees	86.7	94.1	90.7
Percent of husbands in professional occupation	40.0	41.2	40.6
Number of children	2.1	2.0	2.0
Age range of children	0–16	1–12	0–16
Mean age of children (mean of means)	4.2	3.8	4.0
Mean number of children ⩽ 5 years	1.3	1.5	1.4
Goals for children			
Number mentioned	1.3	1.5	1.4
Percent mentioned social development	60.0	52.9	56.3
Percent mentioned emotional development	46.7	70.6	59.4
Percent mentioned school preparation	26.7	23.5	25.0
Percent mentioned custodial care	0.0	0.0	0.0
Percent who knew other participants	80.0	76.5	78.1
Number of others known	3.1	3.6	3.4

most were college-educated housewives with two children (mean age four years). Over three-fourths had taken some coursework related to child care. Their husbands for the most part were also college graduates; nearly half were now in professional occupations. Both groups of parents mentioned social and emotional

[14] Four parents, all in the telephone group, usually watched the programs with other parents or friends rather than alone. Given the small number of group watchers and because watching alone or in a group showed no significant relationship to any outcome measures, that was ignored as an independent variable of interest.

development most often as goals in their child-rearing. Cognitive development was noted as a goal by only one-fourth of the parents, and custodial care was never mentioned. As for social contact with other participating parents, most in both groups knew other participants, and on average knew more than three others.

Because of the homogeneity of the sample, few of the concerns plaguing analysis of the pilot data are present here.[15] A straightforward two-way ANOVA for repeated measures (condition by time of testing) was performed to test for treatment (i.e., technology) differences as well as knowledge gains over time. The results are presented in Table 19 (cell means for the three knowledge indices) and Table 20 (ANOVA for each knowledge index).

Table 19

MEAN NUMBER OF ITEMS CORRECT, BY TYPE OF KNOWLEDGE, CONDITION, AND TIME OF TESTING, EXPERIMENT 2

	Time of Testing		
Condition	Pretest	Posttest	Average
I. Structure (21 items)			
Data and telephone	10.27	12.60	11.43
Telephone alone	10.12	12.29	11.21
Total	10.19	12.45	11.32
II. Operations (10 items)			
Data and telephone	5.73	7.27	6.50
Telephone alone	5.94	7.18	6.56
Total	5.84	7.22	6.53
III. Application (10 items)			
Data and telephone	7.20	7.93	7.57
Telephone alone	7.24	7.24	7.24
Total	7.22	7.58	7.40

More clearly than in the pilot experiment, the present data show that although there was no effect of condition on knowledge acquisition, there were significant gains in knowledge in both conditions over time. Significant gains were found only on the structure and operations indices. However, half the items on the applications index were at ceiling at pretest, so there was little room for improvement on this index.

Because there were no control groups in the two experiments that received no parenting program, we cannot be sure that the gains detected are not attributable to exogenous factors. However, the specific and factual nature of the knowledge tested makes it unlikely that the events in Spartanburg or the excitement of being in an experiment were leading to these gains. The possibility that the parents were made more sensitive to the subject matter being tested in the pretest is a more

[15] In addition to homogeneity of background characteristics, no significant differences on outcome measures at pretest were found.

Table 20

RESULTS OF ANALYSIS OF VARIANCE FOR THREE KNOWLEDGE INDICES, EXPERIMENT 2

Source	SS	df	MS	F	p	% of Total SS
I. Structure (21 items)						
Condition	.82	1	.82	.22	n.s.	.30
Subject within C	112.93	30	3.76	(a)		40.65
Time	81.04	1	81.04	29.32	.001	29.17
Condition x time	.10	1	.10	.04	n.s.	.04
Time x subject within C	82.90	30	2.76	(a)		29.84
Total	277.79	63	4.41			100.00
II Operation (10 items)						
Condition	.06	1	.06	.02	n.s.	.04
Subject within C	76.88	30	2.63	(a)		57.90
Time	30.54	1	30.54	34.71	.001	22.42
Condition x time	.35	1	.35	.40	n.s.	.26
Time x subject within C	26.40	30	.88	(a)		19.38
Total	136.23	63	2.16			100.00
III Application (10 times)						
Condition	1.75	1	1.75	.54	n.s.	1.29
Subject within C	96.99	30	3.23	(a)		71.58
Time	2.14	1	2.14	1.98	n.s.	1.58
Condition x time	2.14	1	2.14	1.98	n.s.	1.58
Time x subject within C	32.47	30	1.08	(a)		23.96
Total	135.49	63	2.15			100.00

[a]Not tested.
n.s. = not significant.

nagging possibility. The subjects took tests that may have raised issues of child development in their minds and aroused interest in the content of the curriculum, priming them for learning the knowledge conveyed by the curriculum.

Some further exploration of the data allows us to better establish the link between the curriculum and learning. The small but significant gains over time on the knowledge indices become more credible as direct products of the curriculum if one can show a link between gains and participation in the program beyond mere testing. For instance, if those subjects who gained also watched more programs or showed more active involvement in the programs through calling in comments and questions, then gain may be more reasonably attributable to the content of the programming. If learning is to occur, the subject must attend to the material to be learned and respond actively to it. Viewing the program content represents interest and commitment to the program and a minimal level of active involvement necessary for learning. Calling in to discuss that content represents a higher level of involvement or commitment to the program and, if reinforcing, may actually stimulate future interest and participation reflected in more viewing and more calling.

A consideration of the attendance data in both the pilot and the subsequent experiment lead to the conclusion that the knowledge gains are due to the cable program. In the pilot experiment, if the parents, a more homogeneous group and

the primary focus of the second experiment, are examined separately, a pattern of relationships emerges: Attendance and calling about a substantive issue (versus a technical problem) show a strong positive relationship ($r = .41$, $p < .01$); and although the number of substantive calls made bears no relationship to success on posttest indices, attendance to programming is positively related to posttest structure scores ($r = .27$, $p = .05$).[16]

In the second experiment, the two indices of level of participation, level of viewing and number of calls about substantive issues, are again positively related ($r = .35$, $p < .05$). Although calling is related to gains only on the application index ($r = .31$, $p < .05$), viewing is strongly related to gains on all three indices (structure: $r = .29$, $p < .05$; operations: $r = .36$, $p < .05$; and application: $r = .38$, $p < .05$).

Taken together, these data suggest that increased program participation predicts enhanced knowledge gain for parents. By attributing gains more directly to the intervention, they show that cable instruction for continuing education is not only feasible but effective. They also suggest that participation in media courses plays a valuable role in knowledge acquisition.

EXPLORING THE ROLE OF PARTICIPATION

These two experiments were designed to test the relative benefits of low-level data interaction combined with telephone return versus only telephone return when either mode is used to complement program delivery. The results clearly demonstrate that data return, at least when minimally used, adds little to the learning process that is directly observable in knowledge gains. Can one conclude that having a home polling terminal has no beneficial effects above and beyond the use of the telephone as an interactive device? Might it not be encouraging a sense of participation or involvement in the program? Is the telephone such a powerful interaction device for both conditions that it overshadows any effect of low-level data interaction? Or is viewing the program in and of itself, without more active involvement, sufficient for observable gains? Confident answers to some of these questions are impossible without data from a new experiment with a control group that receives the programming but does not have the opportunity to participate through some form of return.

One supposition deserves further elaboration. The strong relationships found in the experiment between viewing and gain and between calling and viewing suggest a possible causal chain that should be tested in future research. Recognizing that more than one explanation might account for the correlations we shall discuss here, we explore how the use of the data and telephone return might influence viewing and calling. We wish to understand how media factors may first stimulate participation in the program and then lead to enhanced knowledge gains from the program.

Although having a data terminal may have no direct relationship to knowledge gain in these experiments, it has a discernible relationship to participation. The data group made an average of 5.3 calls to the workshop leader, significantly more

[16] When the entire sample of parents and caregivers is used, the evidence for calling and viewing effect on gains is weak or negative. However, the heterogeneity of the sample may account for the washing out of underlying relationships.

calls during the 12 weeks of programming than the telephone group, which averaged 1.9 calls ($t = 2.76$, $df = 31$, $p < .01$). Understandably, some of the calls made by the data group (and none made by the telephone group) were the result of technical difficulties related to the terminals and transmission, and some calls were concerned with procedural rather than substantive issues. But even when calls about technical or procedural problems are excluded, the data group on average made more calls (3.4 versus 1.9; $t = 1.64$, $df = 31$, $p = .10$). Thus, the use of the return data terminals encouraged participation through use of the telephone.

Why might this be so? One possibility is that because the data group had occasion to call about malfunctions in their terminals and to discover how easy and nonthreatening the calls could be, they were encouraged to call again and discuss more substantive issues. Another possibility is that the data group had to press their terminal buttons a number of times in response to questions over the course of the workshops. Any rewards derived from this low-level involvement in the programs may have encouraged students to participate further through calling. Viewers may have wished to explain and elaborate choices they made with their polling terminals in response to the questions. Each explanation is a different aspect of the hypothesis that *induced participation produces voluntary participation.* Although the first explanation that calling was stimulated by technical problems represents an artifact of the present experiment, any of these explanations, if true, have important implications for the interactive technical capacities and program requirements designed into future cable projects.

What were the subject's perceptions of what influenced their calling habits? In both the pilot and second experiment, subjects completed a *Media Questionnaire* (see App. B) that examined their viewing habits and preferences and their use of and satisfaction with the opportunities for telephone return. The distribution of responses to this instrument by condition is presented in Table 21 for subjects in the second experiment. On many items, the responses were essentially the same. Both groups found the requirement of placing a call awkward and would have preferred a microphone (46.7 and 47.1 percent). Two-thirds of both groups (66.7 and 64.7 percent) felt they would have spoken up more if they had been given microphones. Neither group felt that the program leader discouraged telephone calls, but roughly equal proportions (20.0 and 23.6 percent) of the two groups had their home telephones in locations that made it difficult to call and watch their television sets at the same time.

These similarities make the differences stand out all the more. The group with polling terminals was much less likely (13.3 percent) than the telephone group (35.3 percent) to be concerned that the subject would change before they could call. Those with terminals were less likely to say it was not worth the trouble of getting up and calling (26.7 percent compared with 47.1 percent); and less likely to feel that they would rather listen to the workshop leader than hear discussion (13.3 percent compared with 29.4 percent).

These data suggest that using the data terminals does lead to attitude changes, supporting the view that induced participation increases further participation. Of course, the telephone group could have included viewers who were initially very different from the data group in their reactions toward the communications media. Although there are no pretest data on their attitudes, this explanation seems doubtful in light of their similar backgrounds, test scores, and attitudes toward the

Table 21

PERCENTAGE OF DISTRIBUTION RESPONSES TO MEDIA QUESTIONNAIRE, BY CONDITION, EXPERIMENT 2

	Item on Questionnaire	Condition: Data (n = 15)	Phone (n = 17)
1.	Usually watched alone	100.0	76.5
2.	Talked within group	N.A.	100.0
3.	Mean number of missed programs	8.8	10.2
4.	Reasons for not using phone (indicated as very or somewhat important)		
	a. can't see TV and call	20.0	23.6
	b. subject would change before call	13.3	35.3
	c. afraid to ask silly question	20.0	29.4
	d. leader can't see me	6.7	0.0
	e. not worth trouble	26.7	47.1
	f. rather listen to leader	13.3	29.4
	g. leader didn't want calls	0.0	0.0
	h. could talk within group	N.A.	75.0
5.	Microphone vs. telephone return		
	a. would prefer mike	46.7	47.1
	b. would speak up more with mike	66.7	64.7
6.	Times preferred for workshops (first/second choices)		
	mornings	33.3/33.3	17.6/47.1
	naptime	33.3/26.7	52.9/5.9
	afternoons	20.0/13.3	23.5/11.8
	evenings	6.7/26.7	5.9/29.4
	weekends	6.7/0.0	0.0/0.0
7.	Number of days per week preferred		
	one	6.7	5.9
	two	26.7	29.4
	three	53.3	64.7
	four	6.7	0.0
	five	6.7	0.0
8.	Period of workshops preferred		
	shorter	26.7	35.3
	same	33.3	35.3
	longer	13.3	0.0
	doesn't matter	26.7	29.4
9.	Future of workshops		
	a. would recommend them	93.3	100.0
	b. considered appropriate audience		
	parents	0.0	17.6
	caregivers	0.0	0.0
	both	100.0	82.4
	c. (if "both") *more* appropriate audience		
	neither	64.3	42.9
	parents	21.4	35.7
	caregivers	14.3	21.4

use of microphones. The group with polling terminals seems to have developed greater confidence that they can use the telephone, suggesting that even the minimal use of terminals leads to a reduction of the psychological barriers that limit telephone participation.

The view that data return encourages participation does not find strong support when attendance is the index of participation. In the second experiment, there was a small, nonsignificant difference in the mean number of programs missed by subjects in the two conditions. The data group missed 8.8 programs, and the telephone group missed 10.2 ($t = .46$, $df = 31$, n.s.). But as just indicated, calling and viewing were significantly correlated, suggesting there might be an indirect influence of return condition on attendance. Because viewing is the one participation measure linked to knowledge acquisition, we might then hypothesize that:

- Using polling terminals (induced participation) reduces psychological barriers and increases calling;
- Calling reinforces viewing attendance;
- Attendance leads to knowledge gain.

We can neither support nor reject this model with the data collected in these experiments. Although there are correlations supporting the three separate propositions, these bivariate correlations are subject to multiple interpretations. The causal directions suggested here could be incorrect. For example, the correlation between calling and attendance could be the result if attendance leads to increased calling, but calling does not in turn reinforce attendance. It is also possible that the intermittent and low-level use of the terminals was not a sufficiently robust intervention to produce discernible effects in the causal chain. In light of the success of the adult education experiments, we are left with the possibility that a high frequency use of the terminals would have led to even greater differences in attendance and, consequently, knowledge.

Although we can conclude only that very low-level use of terminals does not lead to marginal knowledge gains above and beyond the use of the telephone, we must remain open to the possibility that polling terminals might have marginal value for learning if they are used more frequently during class, or used by different types of students.

CONCLUSIONS

This discussion should not divert us from the broader point about the efficiency of interactive cable for continuing education. First, the cable medium is effective in producing knowledge gains. Even older, conventional cable systems can be used to offer educational programs, and the educational community clearly has an opportunity to use this standard technology far more than it does now. Because telephone return was available in both groups of subjects, we cannot say whether its interactive capacity was necessary to produce the overall gains, or whether conventional programming without any interaction would have sufficed. In either event, like conventional cable, telephones are widely available and are an inexpensive means of providing the student-teacher interaction in educational programming. Local educational institutions would do well to use them for home education

programs. Second, we feel that the use of interactive terminals should be explored further. Polling terminals are going to be in homes in some cities as part of commercial services, so the testing of that technology is both feasible and valuable. This research suggests strongly that the design of the course should emphasize a high level of interaction. Finally, as experience grows in interactive home education, there appears to be considerable difference in the requirements for different types of students and probably different types of subject matter. As in classroom education, student needs vary and there is no single solution.

V. MARKETS, PUBLIC POLICY AND INTERACTIVE CABLE

The federal role in the development of interactive cable communications could take several forms, ranging from massive intervention with subsidies to the use of regulatory authority to influence its growth, to a complete laissez-faire attitude. On one hand, many have argued that the potential of cable technology for providing and supplementing public services, especially to the physically and socially disadvantaged, is so great that federal intervention is desirable. Moreover, they argue that cable is so unlikely to be used to aid the disadvantaged that intervention is necessary. On the other hand, the government has recognized the cable industry as a private profit-making enterprise with some public responsibility, but not as a public utility. The current, continuing trend is to reduce regulatory requirements placed on the cable operator. Thus, any decision the federal government might make has implications both for public service cable programming and for the government's role in regulating the cable industry as a whole.

Decisions about two-way regulation can be informed by the experiences of Spartanburg's effort to use interactive cable television to deliver public services in basic and continuing adult education. Caution is always required in generalizing from a single community, but the great strength of a field experiment is that it can test the markets for new services in a real world. And the nature of those markets have direct policy implications.

THE CASE FOR SUBSIDY: OUTREACH AND THE DISADVANTAGED

One of the great potentials held out for advanced cable systems is to create new educational opportunities. The argument for subsidizing new cable education programs turns on whether these opportunities will provide material advantages for those who do not have adequate access to conventional education programs, particularly the economically disadvantaged, the physically handicapped, and the homebound citizen. If home education through interactive cable does not help substantial numbers of Americans who cannot use conventional educational institutions, it is hard to justify significant federal support for cable education programs.

One might easily construe the basic adult education program in Spartanburg as a test of the efficacy of a federal subsidy to commercial cable television to reach disadvantaged populations. As pointed out earlier, 54.4 percent (or over 13,000) of Spartanburg's adults over 25 years of age have not completed high school. The same barriers to finishing one's education (e.g., transportation, daycare arrangements) that face potential students elsewhere are present in Spartanburg, and the project offered home education over the cable to test its value in overcoming these barriers. This instructional program was essentially the same as classes offered at a local community college—same curriculum, same teachers; the only difference was the mode of communication and thereby the ease of attendance (see Sec. III).

The project was modeled along lines that a heavily subsidized program might well take. Students were offered free connection to the cable system and free cable service for the four months they were enrolled. The converters and home terminals necessary for reception and transmission of signals between students and teachers were provided free of charge. The only charge was $34.35 for tuition, fees, and books—the same charge made to students enrolling in conventional classes. Significant sums were invested in radio, television, newspaper, and handbill advertisements to ensure some community awareness of the project. In short, everything was done to remove economic barriers to adults who might wish to complete their basic education.

Despite this support, the adult education program was apparently not a market success. Few students participated: The average enrollment for the GED rounds of the experiment was 10.7 cable students, and only 10 enrolled in the pre-GED class. Here we consider whether the marginal turnout is explained by factors that make Spartanburg a poor test of the value of such programs, or a whether it is a sign that a large federal intervention would be a wasted effort.

Recruitment and Awareness

Several possible explanations for the small enrollment turn on the effectiveness of the Spartanburg project in recruiting potential students. The charge has been made that the target population does not use the media well for obtaining information, that word of mouth takes time to distribute information, and in general Spartanburg adults may not have been aware of the adult education opportunities. One cannot argue that the small turnout represents what to expect in future cable education programs unless it can be shown that the adults were aware of the course.

In the three rounds of the experiment, the recruitment campaigns made extensive use of radio and newspaper advertisements to assure awareness of the adult education program among the target population. For six days preceding the first round in spring 1976, ten commercial television spots (each 30 seconds) were purchased; these spots were timed to reach morning viewers on the assumption that these people were available for morning classes and perhaps bound to their homes for lack of child care or transportation. At the same time, coverage was purchased on three local radio stations (117 spot announcements 20 to 30 seconds long) and the local newspaper (6 three-column ads). In addition, handbills were placed in the door of every residence within the cable viewing area.

Advertising was increased in the second round in fall 1976. For 12 days an intensive campaign solicited students by radio (685 thirty-second spots) and newspaper (4 four-column ads). In addition, posters depicting the concept of classes over cable telvision were posted in public areas around the city. Workers in social service agencies were contacted personally as well as by mail and telephone to encourage dissemination of program information.

By January 1977 the community had been saturated with information about the project. In addition to project promotion, six unsolicited newspaper stories had been printed about the project in Spartanburg papers. *TV Guide* had carried an article on the project, and newspapers in other South Carolina cities had carried

stories.[1] For the third round, more radio and newspaper space was purchased, fliers were mailed to cable subscribers, moderate radio coverage and newspaper advertisements were purchased, and recruitment posters were placed in key locations within the cable area. A student who had taken the interactive cable course and subsequently passed the GED was hired as an outreach worker to contact potential students. In this way students could discuss the course with a peer who had first-hand experience with the course.

It was then necessary to establish whether these recruiting efforts were successful in making citizens aware of the education programs. At the end of the third recruiting period in January 1977, a telephone survey was conducted of 323 homes in the city and surrounding urbanized area of Spartanburg. The homes were selected at random from a recent city directory of residences.[2] The survey gathered factual and attitudinal information from audiences of potential interest to cable programmers (e.g., parents of children under six years old, the elderly, the less-educated). (The questionnaire is presented in App. C.) The only notable bias in the responses was that the actual informants about the household tended to be disproportionately female, a common problem in telephone surveys.[3]

These extensive efforts at informing the city of the new program had reached much of its intended audience. From the area survey, we know that a substantial portion (42.7 percent) of all respondents had heard of the adult education project. We can narrow our attention to those households for which the project was most relevant by looking at only those who indicated that they or members of their family were not high school graduates and were under 60 years of age. Among this group of 93 households, a similar proportion (42.4 percent) of the the responding members had heard of the adult education program.

A supplemental questionnaire was also administered as part of this survey (see App. C). It allows us to move to the individual rather than the household level. If the adults answering the telephone indicated they had completed high school, they were asked if there were other adults in the household who had not. In such cases, the project called back and interviewed that adult. By pooling the answers of the original respondents without a high school education and the adults interviewed in this supplemental wave, we obtained a sample of 87 adults between the ages of 18 and 60 without a high school education (Table 22). Of these respondents, two thirds (65.4 percent) had heard of the home cable education program. Their sources varied, showing the extensiveness of outreach. Of those that heard of the project, 28.3 percent heard from a friend or relative; 15.1 percent from newspapers; 20.8 percent from radio; 7.5 percent from fliers; and 37.7 percent from television and from the "cable crawl," a line of public announcements that ran on the automated time and weather cable channel. The survey also makes it clear that some detailed information appears to have gotten across during recruitment efforts. One-third of the respondents without a high school education were at least sufficiently informed

[1] In addition to the *Spartanburg Herald-Journal* and Spartanburg's WSPA-TV, the project descriptions appeared in Columbia's *The State, The Greenville News-Piedmont, The Charlotte Observer,* and on other regional broadcast outlets. Many residents also saw F. S. Swertlow, "Two-Way Cable," *TV Guide*, June 26–July 2, p. 9.

[2] *1976 Spartanburg City Directory*, Hill Directory Publishers, Richmond, Va., 1976.

[3] For a discussion of within-household selection methods and resulting bias in sex distribution, see W. A. Lucas and W. C. Adams, *An Assessment of Telephone Survey Methods*, The Rand Corporation, R-2135-NSF, October 1977.

Table 22

SELECTED VARIABLES FROM TELEPHONE MARKET AND FOLLOW-UP SURVEYS OF ADULTS WITHOUT A HIGH SCHOOL EDUCATION

Background Characteristics	
Number of respondents	87
Age (mean years)	42.9
Sex (percent male)	26.1
Educational level (mean grade completed)	7.8
Awareness of Cable Project	
Percent heard of adult education project	65.4
Percent heard of project through:	
friend or relative	28.3
newspaper	15.1
radio	20.8
television and cable information channel	37.7
flier	7.5
Percent knew some detail of project	32.7
Attitudes Toward Education	
Percent very interested in home television classes	52.9
Percent satisfied with educational level	15.7
Percent planning to go back to school	18.1
Percent indicating good chance of finishing high school	39.0
Percent agreeing that finishing high school:	
opens up opportunities	81.2
involves hard work	77.4
would be useful	85.9
more likely to finish through home television classes	67.5
means getting out and meeting people	61.4
doesn't matter that much	31.0
Percent agreeing that they are not likely to learn much over television	52.0

that they could name some specific aspect of the project (e.g., two-way, GED prep). Most (83.3 percent) of these were cable area residents, attesting to the success of the concentrated efforts within the cable limits. It would appear that the target population was aware of the adult education opportunity.

If we were able to inform the relevant audience about the available adult education program, was it an ambivalence or skepticism about televised education that produced the small turnout? The follow-up survey provided conflicting information about whether this could have been a factor in a person's decision whether to enroll (see Table 22). Fifty-two percent of respondents agreed with a statement voicing doubt about the efficacy of televised instruction ("You don't learn much when you take classes over TV"). However, two-thirds of those respondents felt that they would be more likely to complete high school if they could take classes over television; and well over half of them indicated that they were very interested in home televised classes for finishing high school. Although television in general may not be uniformly regarded as an effective educational medium, the idea of the

convenience of finishing one's education at home seems to have captured the imagination of even the doubters. Therefore, ambivalence to the medium seems not to be a reasonable explanation of the low turnout.

Residential Location and the Geography of Cable

Another challenge to the validity of the Spartanburg project as a test of the market for adult education is based on the geographical coverage of the cable plant. The Spartanburg cable system passes in front of 14,000 homes, but another 6,000 to 7,000 homes are not within reach of the cable. These areas include some prosperous suburbs,[4] but they also include several public housing projects and "mill villages," pockets of homes where workers live near their textile plants. Assuming that cable operators might tend to construct cable in neighborhoods whose residents have a greater ability to pay for cable service, critics have noted that a large proportion of the potential audience for home cable education are excluded because they live outside the cable area.

To test this argument, those interviewed in the city telephone survey were grouped into those who did and those who did not live within reach of the cable. Because the sample for the telephone survey was based on residential listings, it was a simple matter to use the street address of the 323 responding households to determine whether they could have joined the cable program if they wished. Well over half (61.6 percent) of the residences surveyed had access to the cable.

Did a disproportionate number of potential students live outside rather than within the cable area, contributing to the low turnout? Regardless of the reasons behind it, if many or most nongraduates live outside the reach of the cable plant, this differential distribution could explain the small cable class enrollment. The follow-up survey shows, however, that respondents without a high school education were not more likely to live outside (47.1 percent) than inside (52.9 percent) the cable limits.

The 1970 Census indicates an estimated 18,000 adults in the urbanized Spartanburg area without a high school education.[5] Assuming that the telephone sample approximates the proportions of Spartanburg residents inside and outside the cable area and the relative proportions who have not completed high school in these areas, there were close to 11,000 adults who could have enrolled in the home cable courses.

The possibility remains that adults outside the cable area differ in some way so that they may be more eager or willing to participate if given the chance. That is, even though there are the same proportions of adults without a high school education in the cable area, perhaps these adults are less motivated or interested in continuing their education. If true, this possibility would mean that an extensive cable system covering all neighborhoods might have led to a larger enrollment.

We can also examine this question by drawing on the city survey and the supplemental interviews of adults who have not finished high school. As shown in

[4] Some prosperous housing developments and a public housing project have covenants that prohibit stringing cable above ground. Because laying underground cable is fairly expensive, the cable company has instead invested its construction budget in other areas.

[5] The data were added from the 1970 census districts inside the Spartanburg urbanized area, as defined by the U.S. Census. In some cases, the district populations in and outside the area had to be estimated.

Table 23, the two groups did not differ substantially in terms of age, education, or opinions about furthering their education. Both groups report being dissatisfied with their level of education: Only 15.1 percent of adults were satisfied with the amount of education they had received. Overall, 39.0 percent of the target population were optimistic about their chances of finishing their high school education, and 81.2 percent report that finishing would open up new opportunities. Yet only 18.1 percent say they are planning to go back to school. When the sample is divided into those inside and outside the cable area, there were significant differences. However, motivational differences between the two groups are generally in a direction *contrary* to the hypothesis: Although respondents outside the cable more often agreed to the usefulness of the degree, they assented more frequently to statements that finishing high school does not matter much; that one does not learn much through television classes; and that the work involved would be very hard. They also were more likely to say that getting out of the house and meeting people is a reason for returning to high school, suggesting that, if they did return, it would more probably be to a traditional program.

If none of the above explanations accounts for the small number of participants in the adult education experimental series out of a large pool of "disadvantaged," we can be reasonably confident that the value of the programming was given a fair field test.

Table 23

BACKGROUND AND ATTITUDES OF NONGRADUATES TOWARD EDUCATION, BY AREA OF RESIDENCE

	Inside Cable System	Outside Cable System
Background Characteristics		
Number of respondents	46	41
Age (mean years)	41.2	44.8
Sex (percent male)	21.7	31.0
Educational level (mean grade completed)	8.2	7.4
Attitude Toward Education		
Percent very interested in home television classes	47.8	58.5
Percent satisfied with educational level	17.0	14.3
Percent planning to go back to school	22.9	13.5
Percent indicating good chance of finishing high school	45.0	32.4
Percent agreeing that finishing high school:		
opens up opportunities	86.4	75.6
involves hard work	74.4	80.5
would be useful	79.5	92.7
more likely to finish through home television classes	69.0	65.9
means getting out and meeting people	56.8	66.7
doesn't matter that much	25.6	36.6
not likely to learn much over television	43.2	60.5

Universal Barriers

Is then a turnout of 12 students in spring 1977 to be considered a failure of the market for compensatory education programming? It seems evident that the federal government cannot invest major subsidies to establish interactive cable systems and services for populations of this size. But it is important to note that there are many social, economic, and personal barriers to student enrollment in all forms of adult education, including both conventional and cable classes. As pointed out in Sec. III, conventional classrooms also fare poorly in reaching potential students; only a very small percentage, 2 to 5 percent, of Spartanburg's adult population in need of basic or high school education has enrolled in existing programs. The barriers for cable and conventional programs are probably much the same, and these universal barriers provide a context for judging the implications of the "small" turnout.

Placement of enrollees into different class levels depending on past education first fragments the potential base from which GED-level programs can draw. Available data on the entire county of Spartanburg show that, of those without a high school education, 17.4 percent do not have even a fifth-grade education and therefore could not have entered the TEC classes. Another 29.2 percent have not completed eighth grade and are potential candidates for a pre-GED program similar to that offered in fall 1976, but few in this group are ready for the GED course itself. The proportion of adults with at least an eighth-grade education is 53.4 percent of this population without a high school education.[6] (This proportion might be somewhat higher in urbanized Spartanburg because there is a somewhat higher proportion of undereducated adults in the more rural areas.) Thus, the potential pool of the less-educated available for adult education programs is split into different levels of educational readiness, and the actual pool of adult students eligible for the GED now appears to be under 7,000.

There are further reasons for the limited turnout of this pool. Perhaps most important, attitudes toward the need for education vary. For young adults, enrollment in Spartanburg TEC classes typically goes up with unemployment and declines when jobs are available. Many potential students are satisfied with their jobs and way of life and are content to do without the high school degree or its equivalent unless the economy or some other outside force intervenes in their lives. For older adults, a high school equivalency degree may not contribute to opportunities for advancement, and the degree may be even less relevant for retired citizens. As we have seen, some of the strongest motivations to return to school are job related, and these factors are simply less important to those late in their careers or retired. The oldest student in either cable or conventional classes during the experimental period was 53. Because the over-60 population is 24.9 percent of Spartanburg's adult population, 60.3 percent of whom are not high school graduates,[7] the total pool of adults inside the cable area likely to enroll is reduced even further.

The potential students who move to the point of actually returning to school encounter more immediate barriers. Before they can enter GED programs, all students must be tested to ensure that they have adequate preparation to start a course. Testing is a major factor discouraging potential students from signing up

[6] These percentages are based on Census data on only the city of Spartanburg.

[7] These percentages are also based on Spartanburg Census data.

for any program. Also, unwillingness to admit that one lacks sufficient education may prevent nongraduates from enrolling or even seeking information about such programs. Timing of classes convenient to child care and work schedules places further restrictions on an available student population. Those who work in the day cannot also take classes, just as those on the night shift cannot attend evening programs.

Another factor is competition among local educational agencies. Compensatory education programs run by the local school districts are financed according to the number of students they attract. The area schools in Spartanburg naturally continued to run night courses directed toward a diploma program throughout the cable experiments. After a student passes 12 courses, he receives a diploma without a test, but it may take two to four years to complete the series of courses. One reason we chose the GED approach was to avoid local competition for students because the local schools did not have much interest in that approach. But in January 1977, when we began our third GED class, a local school district advertised and started a new GED program based on conventional face-to-face teaching three blocks from the studio.

In face of all this, the pool of adults eligible to enroll in any form of adult GED education is much smaller than it first appeared, and the number ready and willing to enroll is going to be smaller yet. In fact, the Spartanburg courses attracted class sizes consistent with the size of other programs in the area. Many familiar with the field of adult education might even consider a class of 12 to be a meager success of the type that the field has come to expect.

One cannot retreat from the fact that the numbers attracted by the Spartanburg courses are small and that, in our judgment, they represent the recruitment levels one might expect in other locales. These numbers hardly justify federal programmatic support for cable systems; but although the numbers are small, the students did learn, and substantial proportions went on to pass the GED and obtain better jobs. Many of these students would not have been likely ever to enroll in conventional programs. What other policy means are available to add this type of opportunity to those available for disadvantaged populations?

FEDERAL REGULATION AND TWO-WAY REQUIREMENTS

Another vehicle for bringing about interactive cable systems is a federal regulation. Cable operators of new systems of over 3,500 subscribers have been required to provide an interactive "capacity." A brief examination of the net effect of these regulations does not lead to optimism about the government's ability to regulate interactive programs into existence.

As a practical matter, current cable equipment is engineered so that most operators can meet this rule symbolically. The amplifiers now commonly used in these systems contain the space for a separate module that would transmit return signals. The operator takes the position that when there is a demand for interactive services, he will install those modules. Because the standard line of amplifiers also permits the carriage of more channels than the FCC rules require, the operator thus meets the multiple channel requirements and provides the "potential" for interactive programming.

This approach neglects the critical role played by the quality of the materials and the construction of the system. Spartanburg's cable system has, as a rough estimate, 40,000 connections, from trunk cable to amplifier trunk cable to feeder line to drop line to home. Any one of these connections, or the quality of the cables, could create technical problems. The frequencies used on the cable are used for other purposes in the atmosphere, and a break in the system that insulates the cable frequencies from those in the atmosphere permits interference. These interfering signals, or "ingress," cause some difficulty for the forward cable system, and operators maintain the system to insure that the quality of commercial television signals being distributed to home subscribers are not greatly degraded. But the return signals on a cable system are much more vulnerable to ingress,[8] requiring high standards of equipment and maintenance that are not often being applied to most systems constructed to meet the 1972 FCC regulations.

To seek a current and real interactive capacity on cable systems would require a level and detail of regulation that may be out of the question. Moreover, even if one were to advocate such regulation, the cable industry would correctly note that local education agencies and consumers have not asked for that capacity, much less offered to pay for it. If the cable operator must provide this more expensive capacity, the cost will ultimately be carried by subscription fees. It would cut profits, or raise consumer costs, or both, for a service no one has demanded.

Finally, perhaps the market will take care of the problem. To the degree there is no market for home education, the regulations may not be warranted. To the degree that educational programs will increase the number of subscribers for a cable system and generate additional revenues, the cable industry over time can be expected to move in this direction without further regulation.

Markets for Continuing Education

As reported in the Introduction, there are vast potential markets for home education. Courses for professionals, college courses, and continuing education in any number of fields could be offered. The parent education course was selected in part because it exemplified the continuing education area where the evidence about the market is the weakest. When there is no job credential or course credit, will citizens enroll and stay in a home cable program?

The two parent education courses offered in fall 1976 and spring 1977 suggest there is an extraordinary market for continuing education. In the first offering, a single newspaper article appeared in the local newspaper, and there was no further use of the media. Through contacts developed in the daycare center training program offered the previous spring, a list of potential participants was compiled, including mothers of young children and caregivers providing daycare. A letter was sent to each of 44 possible participants describing the program in brief, and a telephone call followed the letter.

As it developed, all but four of the parents were already subscribing to cable, and for them the course involved no additional cost. Of 40 homes on the cable, 14 (35 percent) enrolled. One of those without cable began subscribing to cable to join

[8] For a nontechnical review of the interference problems, see Hubert J. Schlafly, *The Real World of Technological Evolution in Broadband Communications*, TelePrompter Corporation, New York, September 1970, particularly pp. 22–23.

the course. Six more parents on the cable sought out the project director and asked to join.

In the spring, this group was the source of a second list of names, this time composed mostly of young mothers.[9] After 57 letters were sent to parents in the cable area, follow-up calls were again placed. Of the 53 already on cable, 29 (or 54.7 percent) enrolled. Two of the four without cable began to subscribe to get the course.[10] It seems evident that there is a strong interest in parent education in Spartanburg.

Spartanburg residents also find other courses interesting, suggesting a broad market for adult education courses. The telephone survey included a series of questions asking the respondents' interest in credit and noncredit programs. It must be emphasized that saying one is interested is a far cry from enrolling and attending. From that perspective, the parent education program is by far the more robust test of a market. But because Spartanburg residents did come forward for that form of home education, one can ask about other subjects.

The questions were generally broad, asking about the types of courses typically offered in continuing education programs around the country. The results are presented in Table 24. Preferences are related to sex, so here one must take into account that the respondents were disproportionately female. The results are weighted so that males and females are represented in the same proportion as in Spartanburg.

The results indicate that there is strong interest in cable education. Excluding those who are "not interested" or "somewhat interested," we find that between one-fifth to over one-half the respondents are "very interested" in each area. How-to-do-it and arts and crafts programs are clearly the most popular among those who live inside the cable area. Half the weighted sample (51.4 and 46.5 percent) are interested in each of these topics, and 40.3 percent are very interested in the more specific example of car repairs. Sports programs follow with 41.8 percent. Games lag somewhat behind, but still 35.6 percent feel they would be very interested in using cable for this purpose. Nearly one-third (31.6 percent) said they were very interested in accredited college courses and, most surprising, one-fourth (25.4 percent) were interested in foreign languages. This last finding may reflect the heavy influx of foreign investment in Spartanburg and the presence of German, Swiss, and French executives in local branches of foreign corporations.

Because families are less likely to pay the costs of a cable subscription for a single course, one can aggregate these interests to obtain an idea of the distribution of the demand. First, the responses to the question on auto repairs were excluded so as not to double-count the do-it-yourself field, and a count was made of the number of the remaining six areas that attracted each respondent. A small proportion (11.2 percent) are not very interested in any topic. At the other extreme, 24.4 percent report being very interested in four or more. Two-thirds (64.4 percent) fall in between, interested in one, two, or three programming types. If one can take these statements seriously, there is a wide audience for continuing education programming that could be served by cable television.

[9] Letters were also sent to those employed as caregivers at daycare facilities and homes. Responses to four letters led to 16 participants, including six who watched at one site and eight at another. The focus here will be on parents, however.

[10] In addition, another person sought out the project staff to join. It is also interesting that in each of the two experiments there were households on the cable that paid substantially overdue bills to join.

Table 24

INTEREST IN CONTINUING EDUCATION PROGRAMMING

	Percent of Respondents in Cable Area[a]
Respondents saying they are "very interested" in:	
How-to-do-it programs, home repairs, or sewing	51.4
Understanding your car and how to make minor repairs	40.3
Programs on arts and crafts—for example, quilting or furniture making	46.5
Sports programs—for example, a program on football plays used in professional football	41.8
Games you can play at home on your own television set	35.6
Courses for college credit	31.6
Learning foreign languages	25.4
Number of Program Types[b] Respondents Find Very Interesting.	
None	11.2
One to three	64.4
Four to six	24.4
	100.0

[a]Based on a weighted sample of 160. The weight factor is 1.86 for males and .71 for females. For large numbers of respondents, sex was not ascertained, and those responses are weighted 1.0.

[b]Excludes interest in car repair programming.

Going beyond the Spartanburg project, the next step seems quite simply to test these markets and the willingness of cable subscribers to pay for education programs. Movies continue to be the major fare offered in pay cable programming around the nation, and that will be the significant addition to commercial television signals on cable systems for some time to come. There appear to be markets for continuing education, however, and market forces might well be sufficient to bring education into the home on the cable.

One objection to this view is that this growth will not serve those who most need it because those without a high school education are less likely to subscribe to cable service. But the survey found that the interest in cable education does extend into those homes whose members need formal education. In fact, for those households in the Spartanburg area survey providing data on this question, households with one or more members who have not completed high school are about equally interested in continuing education (see Table 25). These households are somewhat more likely (20.3 percent) to say they are not very interested in any programming area, but an equal proportion are interested in four or more types. Although these homes with undereducated adults might be more reluctant to enroll in continuing education on a commercial cable because of cost, there is close to the same motivation. The growth of cable education could reach into homes at most socioeconomic levels.

Table 25

INTEREST IN CONTINUING EDUCATION PROGRAMMING, BY TYPE OF HOUSEHOLD

	All High School Graduates	One or More Nongraduates
Number of Respondents[a]	230	28
Percent saying they are "very interested" in:		
How-to-do-it programs	45.2	54.4
Arts and crafts programs	45.1	46.1
Sports programs	39.6	32.9
Games at home	34.2	26.9
College credit courses	29.9	40.7
Foreign language programs	22.3	25.0
Number of program areas respondent finds very interesting:		
None	13.8	20.0
One to three	65.3	56.9
Four or more	20.9	22.8
	100.0	100.0

[a]The substantial drop in the number of households with members who do not have a high school diploma was caused by this question series being skipped in the supplemental interviews to hold down their length.

DEREGULATION AND THE GROWTH OF INTERACTIVE CABLE

Cable television is a proven vehicle for bringing education into institutions and homes, but it should be viewed as one alternative among many. Interactive cable, allowing students to respond to live instruction, can be as good as face-to-face classroom interaction. For many students, however, personal contact and the simple opportunity to get out of the house are key factors. For these students the interactive capability may not be enough. For others, the expense of interactive terminals is not necessary because they are sufficiently motivated to learn without a return capacity. And certainly the telephone could be used more creatively for home education programming.

As one alternative, however, interactive cable systems should be fostered. Although two-way cable systems are not likely to cause a revolution in compensatory education, they do create new opportunities and a new form of outreach for adults who might otherwise never complete their education. In light of the nature and and size of the markets found in Spartanburg, subsidies and detailed regulations to establish such systems are not warranted. The Spartanburg experience indicates the most promising avenue to be the growth of commercial interactive cable systems.

The role of the federal government should therefore be to remove the regulatory barriers to the evolution of advanced cable systems. As noted in the Introduction, the current trend is to deregulate cable. To the degree these changes increase the flexibility and profitability of cable systems, continuing education will probably

benefit. A few cable systems have aleady begun to test the continuing education markets as a source of revenue; if these tests are successful, the industry will continue in this direction. These changes will not come quickly, and initially they may not involve an interactive capacity in the home. Pay cable television still is primarily offered by accessing a channel, and only a handful of cable systems now have any form of interactive commercial services. The real breakthrough will begin when commercial systems that require an interactive capacity for pay cable television, fire and security systems, or some other purpose prove profitable. Then programs for the disadvantaged could be offered at a very low marginal cost, and even classes for adults wishing to complete high school might be conducted at acceptable cost.

For the present, the federal government should recognize that technological innovation in this field is painfully slow but inevitable. The recent and continuing removal of restraints on the growth of the cable industry may well be sufficient to allow home cable education to prosper. One can always take more aggressive steps in the future, but it seems appropriate now to watch the market forces at work to see if they are sufficient to bring interactive education into the home.

Appendix A

CHILD DEVELOPMENT PRINCIPLES FORMING FRAMEWORK OF CURRICULUM

The parent education program drew upon the child development literature that has been heavily influenced by the work of Piaget. Six principles guided the curriculum, and four of these are based directly on a Piagetian perspective.

1. **Intellectual Development Occurs in an Invariant Sequence of Stages.** Piaget distinguishes four stages in a child's cognitive development: (1) sensory-motor period (0–2 years), in which coordination among the sense modalities (e.g., looking at things heard, grasping at things seen and heard, manipulating things seen) form the action basis for subsequent symbolic thought; (2) pre-operational period (2–7 years), in which representational thought begins but is fairly unorganized; (3) concrete-operational period (7–11 years), in which fairly stable and orderly cognitive structures (called "groupings") are formed and systematically brought to bear on the world; and (4) formal operational period (11–15 years), in which cognitive structures develop for logical and propositional thought and the ability to deal with both reality and possibility. The curriculum, addressed primarily to parents of preschoolers, concentrated on the first three stages.

2. **Each Stage in the Development of Intelligence is Characterized by the Presence or Absence of Specific Cognitive Operations.** One of the most significant accomplishments during the sensory-motor period is the development of the object concept. That is, the child discovers that objects do not cease to exist when they are out of sight; objects have a contained existence even when they are not being acted upon by the child. All subsequent logical thought depends on this discovery. Related concepts developing during this period are object variance, causality, intentionality of purpose and differentiation of self from non-self. Major characteristics of the subsequent pre-operational stage are (a) dominance of perception on the child's judgments; (b) attention to only one object property at a time; (c) transductive (vs. logical) reasoning (i.e., reasoning from the specific to the specific); and (d) egocentrism, the child's viewing the world from his own point of view, without awareness of the existence of any other point of view. The dominant characteristic of the concrete operations stage is conservation, the recognition that certain properties of objects remain unchanged despite certain changes in the objects themselves.

3. **The Child Develops Physical, Social, and Logico-mathematical Knowledge During Each Stage.** Physical knowledge concerns the properties of matter and the development of a repertoire of activities to perform on objects. Social knowledge is derived from feedback from people and includes information about occupations and activities as well as rules for behavior. Logico-mathematical knowledge concerns classification, seriation, and development of number concepts. The curriculum emphasized the kinds of activities that provide an integrated learning experience involving all three kinds of knowledge in every stage.

4. **The Child's Active Construction of Knowledge Occurs in His Confrontation with his Physical and Social Environments.** Learning is not passive

or a simple process of absorption; it is a constructive act that involves the child's present and past experiences. For this active construction to occur, the child and his existing cognitive organization must confront and respond to the immediate environment. Thus the curriculum emphasized activities that allow the child to actively manipulate his environment.

The two remaining principles were derived from a variety of sources and were intended to address specific concerns with the role of language in child development and understanding child behavior and behavior management.

5. **Language Involves the Representation of Individual Objects and of Physical, Social, and Logical Knowledge.** Representation is the ability to evoke an internal symbol, a word of image, to refer to something that is not present. Once a child's cognitive development allows him to represent things in his world, he can begin to conceptualize and categorize. In turn, the child's ability to recognize, identify, discriminate, and manipulate the features of the world around him influences his acquisition of language. In the curriculum, the emphases in this area were placed on: (a) the active construction of mental images, creating symbols as in socio-emotional play or with a variety of media, and (b) a variety of activities involving labeling, sharing of ideas, open-ended question, manipulation of symbols and sounds, and other language stimulants.

6. **To the Degree the Child is Forced to Behave in Response to External Controls, He Will Not be Able to Develop Internal Controls.** The child's moral judgments and his development of autonomous behavior develop in distinct stages just as his cognitive structures do. Piaget illustrates the development of morality through a child's changing attitudes and behavior in respect to rules of a game. He notes these points in his study of the development of respect for rules:

a. Children through ages 7–8 consider themselves humbly submissive to the rules that govern their lives.

b. The young child, while holding a divine respect for rules, does not have adequate understanding or motivation to be consistent in the practice of rules.

c. Not until the child is about 11 or 12 years old will his knowledge and respect for rules approximate his practice of the rules.

d. It is through cooperative activity with peers and then adults that the child develops an understanding of the purpose and origin of rules.

Implications for the curriculum were that use of adult superior force and commands demanding a blind obedience reinforce a unilateral view of rules, whereas dialogue and discussions that bring about mutual understanding and agreement lead to cooperation and eventually to autonomy.

Appendix B

DATA COLLECTION INSTRUMENTS FOR PARENT EDUCATION EXPERIMENTS

SDP # [| | | | | | | | |]

ID # [| | | | | | | | | | | | | |]

RA [|]

FACE SHEET

PARENT INFORMATION FORM

NOTE: This form is only to be used with a parent, not a person employed as a caregiver.

INTERVIEWER'S NAME: ______________________________

DATE: [| | | | |]
MO DAY YR

TIME: A. [|] [|]

B. A.M. 1
P.M. 2

tear line

____
PARENT'S NAME

This form asks some background questions about the people in your household.

1. Is your family a two-parent or one-parent household?

Two-parent	1
One-parent *(Skip to Q. 3)*	2

2. How old is your husband? *(Round to nearest year)*

☐☐ YEARS

a. What was the last grade in school he completed?

Grade 5 or less	1
Grades 6-8	2
Grades 9-11	3
Grade 12	4
Some college	5
College graduate	6
Graduate work	7

b. What is his occupation?

____

3. How old are you? *(Round to nearest year)*

☐☐ YEARS

4. What was the last grade in school you completed?

Grade 5 or less	1
Grades 6-8	2
Grades 9-11	3
Grade 12	4
Some college	5
College graduate	6
Graduate work	7

5. Besides the cable TV workshops, have you had any special training in human development? Specifically, have you:

	YES	NO
a. A degree in early childhood education or child development?	1	2
b. Some coursework in early childhood education or development?	1	2
c. Some general coursework in psychology or human development?	1	2
d. A certificate in child care?	1	2
e. Attended workshops in specific child care skills?	1	2

(If a, b, c, d, and e are answered NO, go to Q. 6)

f. How long ago was the last training you received?

☐☐ YEARS AGO

6. What is your occupation?

____

7. How many children are members of your household?

[|] CHILDREN

a. Please describe them by sex and age.

Child	Sex	Age
1	___	___
2	___	___
3	___	___
4	___	___
5	___	___

8. Please tell me in your own words what you hope your children will get from their experiences here in the home.

____

____

____

9. Do you know anyone else who is taking the cable TV workshops?

YES.................................. 1

NO..*(Go to end of form)*.............. 2

a. How many people you know will be taking the workshops?

☐☐ PEOPLE

b. [Is this person] [Are any of these people]

	YES	NO
Friends who live in your neighborhood?	1	2
Other friends?	1	2

[*Interviewer: check respondent's race*]

WHITE ☐

BLACK ☐

OTHER ☐

[*GO TO NEXT FORM*]

SDP # | | | | | | | | | | |

ID # | | | | | | | | | | | | | | | |

RA | | |

FACE SHEET

CAREGIVER INFORMATION FORM

NOTE: This form is only to be used with a person who is employed as a caregiver, not with a parent.

INTERVIEWER'S NAME: ______________________________

DATE: MO DAY YR

TIME: A.

B. A.M. 1

P.M. 2

tear line

____

CAREGIVER'S NAME

CAREGIVER INTERVIEW FORM

This form asks some background questions about you and where you work.

1. How old are you? *(Round to nearest year)* [ ][ ] YEARS

2. What was the last grade in school you completed?

Grade 5 or less........................	1
Grades 6-8.............................	2
Grades 9-11............................	3
Grade 12...............................	4
Some college...........................	5
College graduate.......................	6
Graduate work..........................	7

3. Besides the cable TV workshops, have you had any special training for your job in child care? Specifically, have you:

	YES	NO
a. A degree in early childhood education or child development?	1	2
b. Some coursework in early childhood education or development?	1	2
c. Some general coursework in psychology or human development?....................	1	2
d. A certificate in child care?	1	2
e. Attended workshops in specific child care skills?	1	2

(If a, b, c, d, and e are answered NO, go to Q. 4.)

f. How long ago was the last training you received?

[ ][ ] YEARS AGO

4. As a caregiver, do you:

	YES	NO
a. Care for children in the parents' home? ...	1	2
b. Care for children in your own home?	1	2
c. Care for children in a center?	1	2

5. What are the ages of the children you care for during the day?
How many children are: [Note: Put [0|0] if the caregiver cares for no children of that age.]

a. A year old or younger? [|]

b. Two years old? [|]

c. Three years old? [|]

d. Four years old? [|]

e. Five years old? [|]

f. Six years old? [|]

g. Seven years old or older? [|]

6. Occupation of Head of Household

This card *(present card)* is a list of occupational categories. Please think of the total number of children and for each child try to assign the head of his or her household into one of the occupational categories. For example, let's say three children for whom you care come from families which have service worker heads. Two of these three children may even come from the same family. Then the number of the children from families with heads in the "Service Workers" category would be three.

Usually the head of the child's household is the father. However, if the child lives only with the mother, the mother is the head of that child's household.

Two categories require special explanation: The "Unemployed" category is used only when you know that the household head is out of work, and you do not know what he or she ordinarily does. If you know the usual occupation of an unemployed head, use the occupational category into which the head falls when working. The "Housewife" category is used only if the child's mother is the head of the household and does not work outside the home.

(If there are no children from homes with heads who fall in a particular category, put [0|0] next to that category.)

How many heads of households are:

Professional workers? ☐☐

Administrative, managerial, supervisory workers? ☐☐

Technical workers? ☐☐

Clerical and sales workers? ☐☐

Craftsmen and production-process workers? ☐☐

Service workers? ☐☐

Semi-skilled and unskilled workers? ☐☐

Unemployed? ☐☐

Housewives? ☐☐

7. How many adults regularly work with you in caring for the children who are your responsibility?

☐☐

8. Please tell me in your own words what you hope the children will get from their experiences with you.

____

____

____

____

9. Do you know anyone else who is taking the cable TV workshops?

YES......................	1
NO *(Go to end of form)*..	2

a. How many people you know will be taking the workshops?

[ ][ ] PEOPLE

b. [Is this person] [Are any of these people]:

	YES	NO
Caregivers where I work........	1	2
Other caregivers...............	1	2
Friends who live in my neighborhood	1	2
Other friends	1	2

[*Interviewer: check respondent's race*]

WHITE	[ ]
BLACK	[ ]
OTHER	[ ]

[*GO TO NEXT FORM*]

CARTOON BOOKLET

INSTRUCTIONS FOR FILLING OUT THE CARTOON FORM

You should have two forms: a booklet of cartoons and a sheet of paper with numbered spaces. The booklet contains a series of cartoon stories. As you go through the booklet, you'll notice that the children get older. The first situation involves a tiny baby; the last situations, children who are five and six years old.

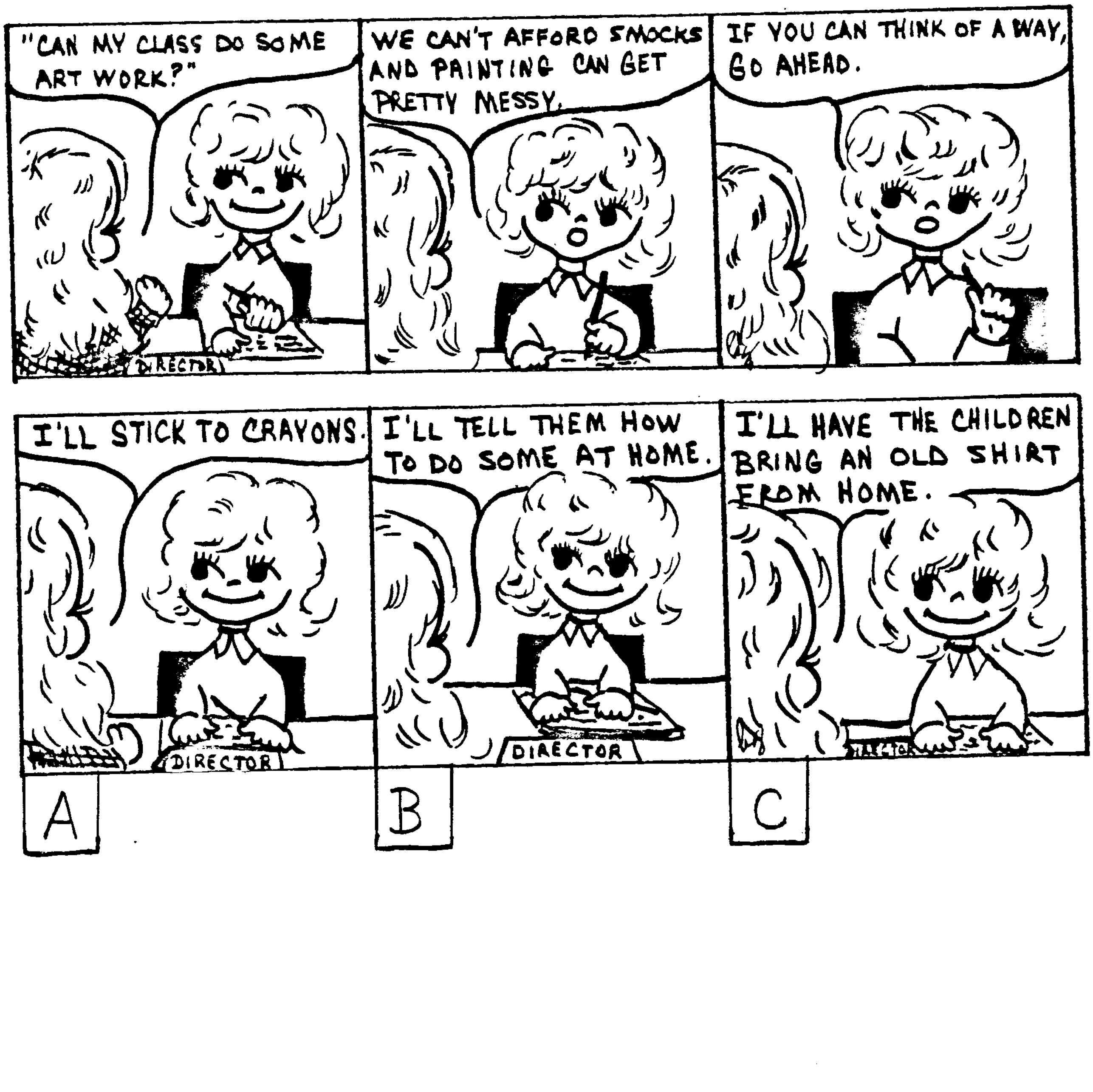
Each cartoon set has six pictures. The *top* three pictures of each set show a situation a parent or caregiver at a center might encounter in a day. In the example, the top row describes a common situation for a caregiver: how to have children do artwork in a group care setting. The *bottom* pictures show three different ways, labeled A, B, and C respectively, that the cartoon story could end.

What we would like you to do for each set of cartoons is to look at the top three pictures in the set. After you see the situation described in the top three pictures, please choose ONE picture from the bottom three pictures that you think best describes what *you* would do in that situation. In other words, you are choosing the picture in the bottom row you think best "completes" the situation described in the top three pictures on that page.

After you choose one of the three alternatives, we would like you to record your choice on the sheet with the numbered spaces. If you thumb through the booklet of cartoons, you'll notice that each set of six pictures has a number in the top right-hand corner. You should record your choice for a particular set--A, B, or C--on the line with the same number as that set. For example, after reading the first set of cartoons, if you choose alternative "A" you would put "A" on the line next to "1." If you choose "B," you would put a "B" on that line; if "C," a "C" on that line. We would like you to record your choices for all of the cartoon sets.

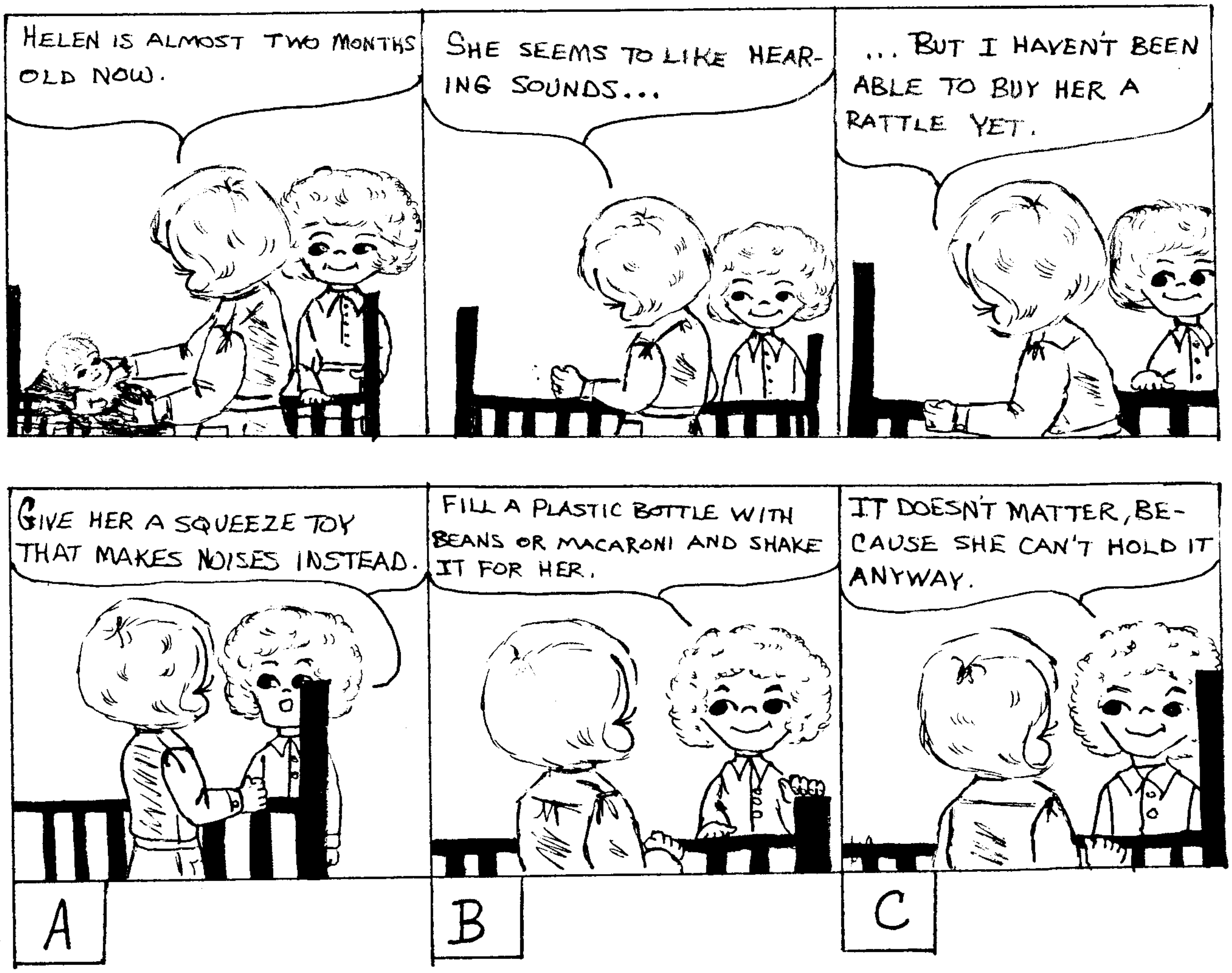
If you have any questions, the research assistant will be happy to answer them.

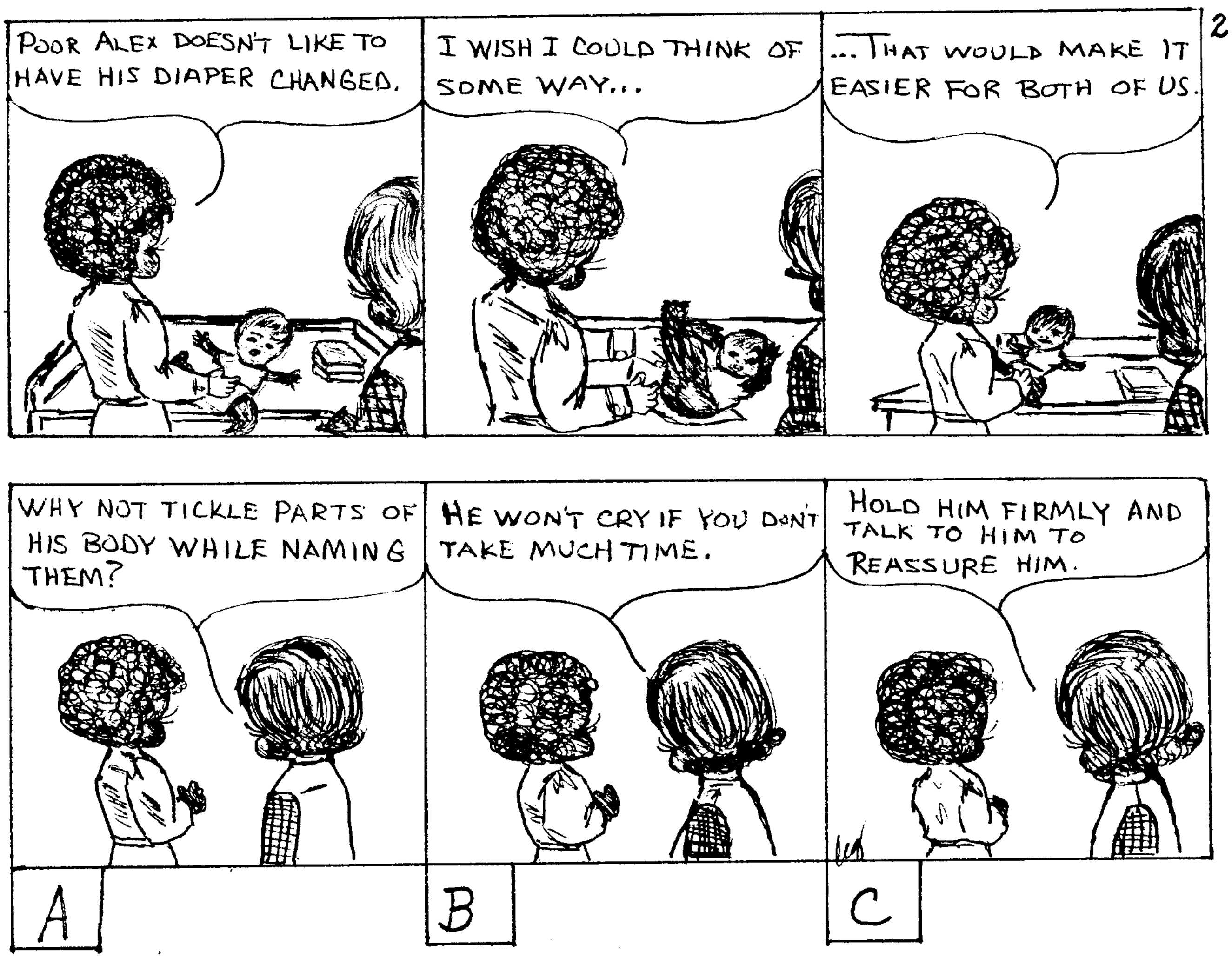
EXAMPLE


"CAN MY CLASS DO SOME ART WORK?"
WE CAN'T AFFORD SMOCKS AND PAINTING CAN GET PRETTY MESSY.
IF YOU CAN THINK OF A WAY, GO AHEAD.
DIRECTOR
I'LL STICK TO CRAYONS.
I'LL TELL THEM HOW TO DO SOME AT HOME.
I'LL HAVE THE CHILDREN BRING AN OLD SHIRT FROM HOME.
DIRECTOR
DIRECTOR
A
B
C

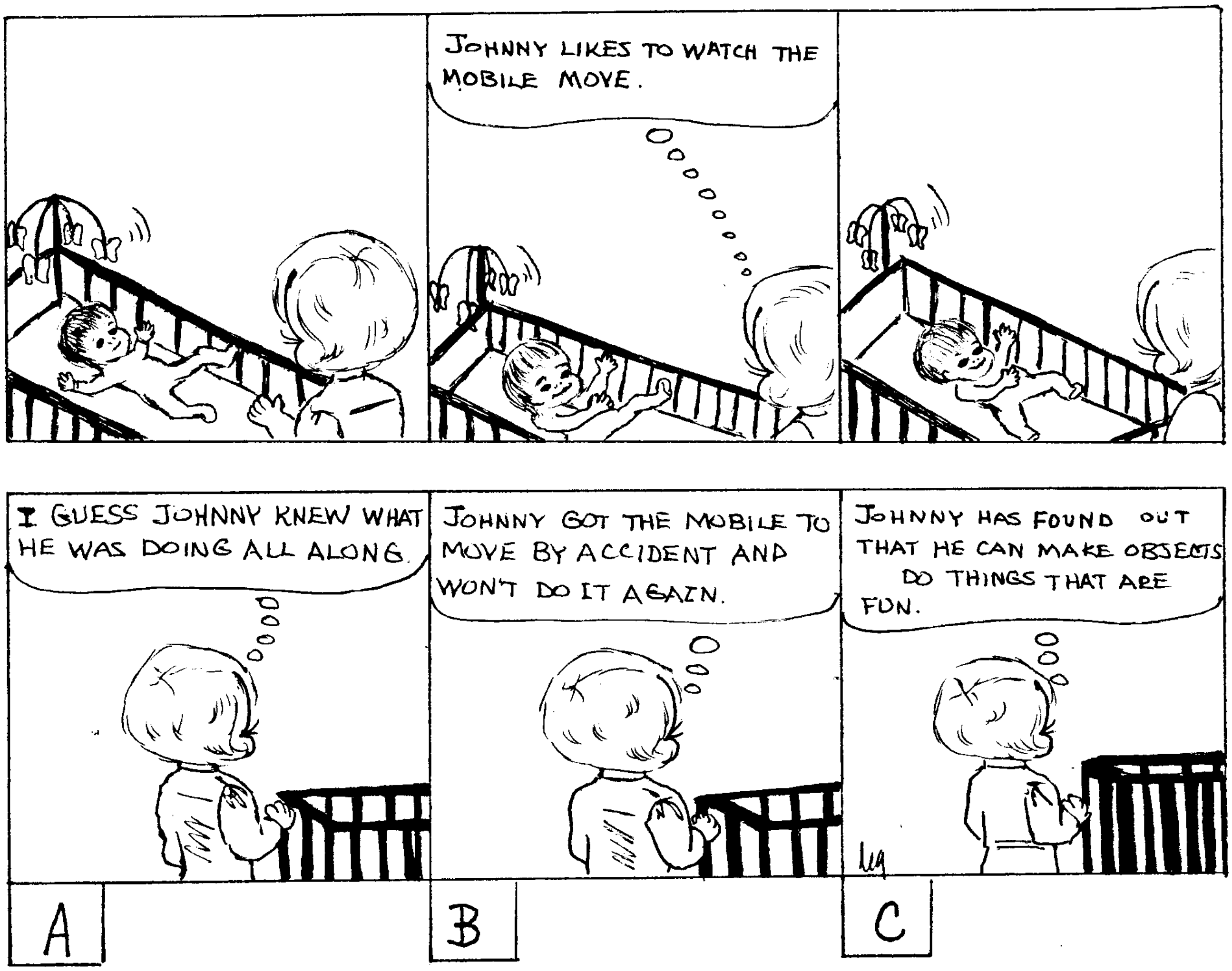
LET'S THINK ABOUT THE INFANT.

1.

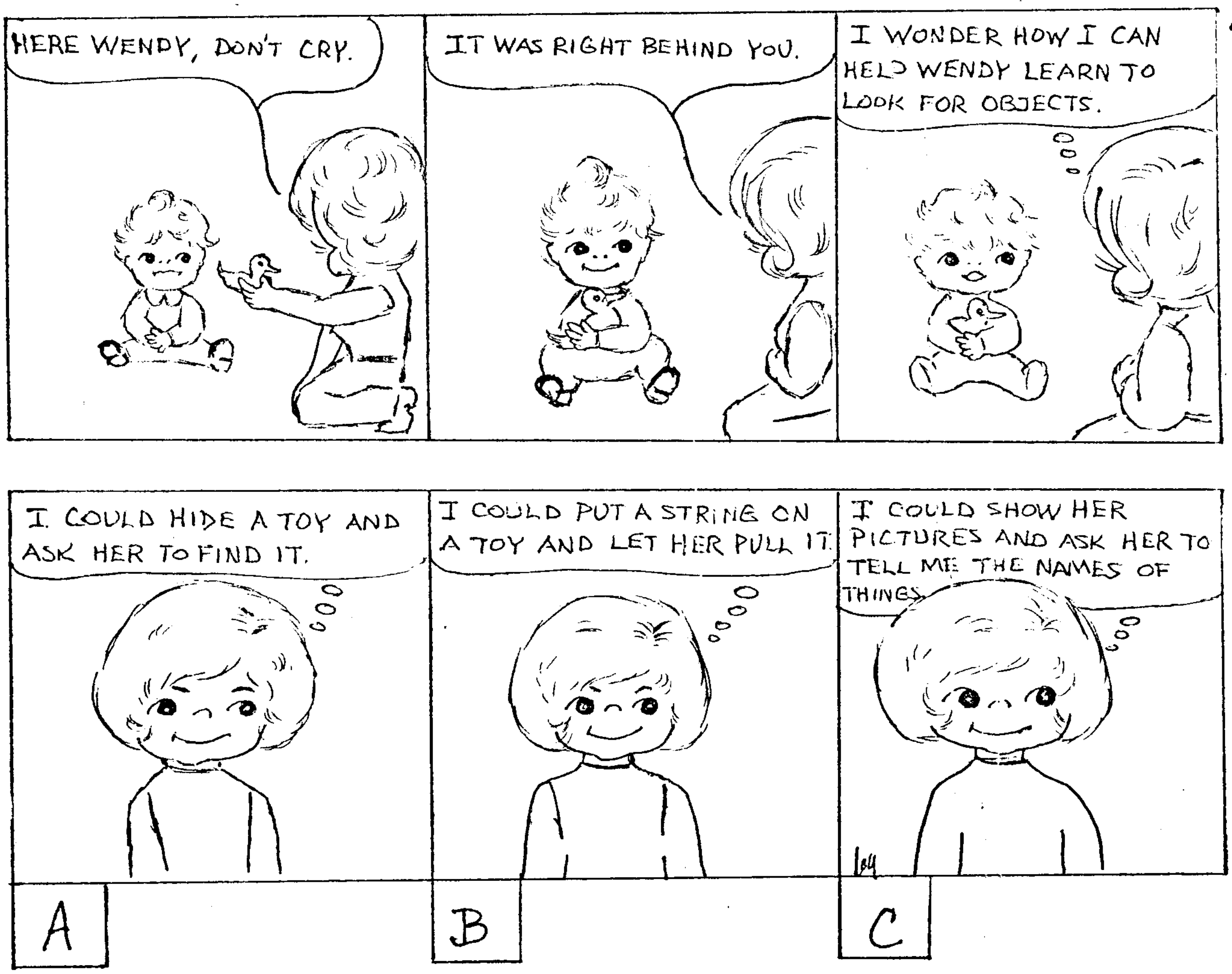

HELEN IS ALMOST TWO MONTHS OLD NOW.
SHE SEEMS TO LIKE HEARING SOUNDS...
... BUT I HAVEN'T BEEN ABLE TO BUY HER A RATTLE YET.
GIVE HER A SQUEEZE TOY THAT MAKES NOISES INSTEAD.
FILL A PLASTIC BOTTLE WITH BEANS OR MACARONI AND SHAKE IT FOR HER.
IT DOESN'T MATTER, BECAUSE SHE CAN'T HOLD IT ANYWAY.
A
B
C

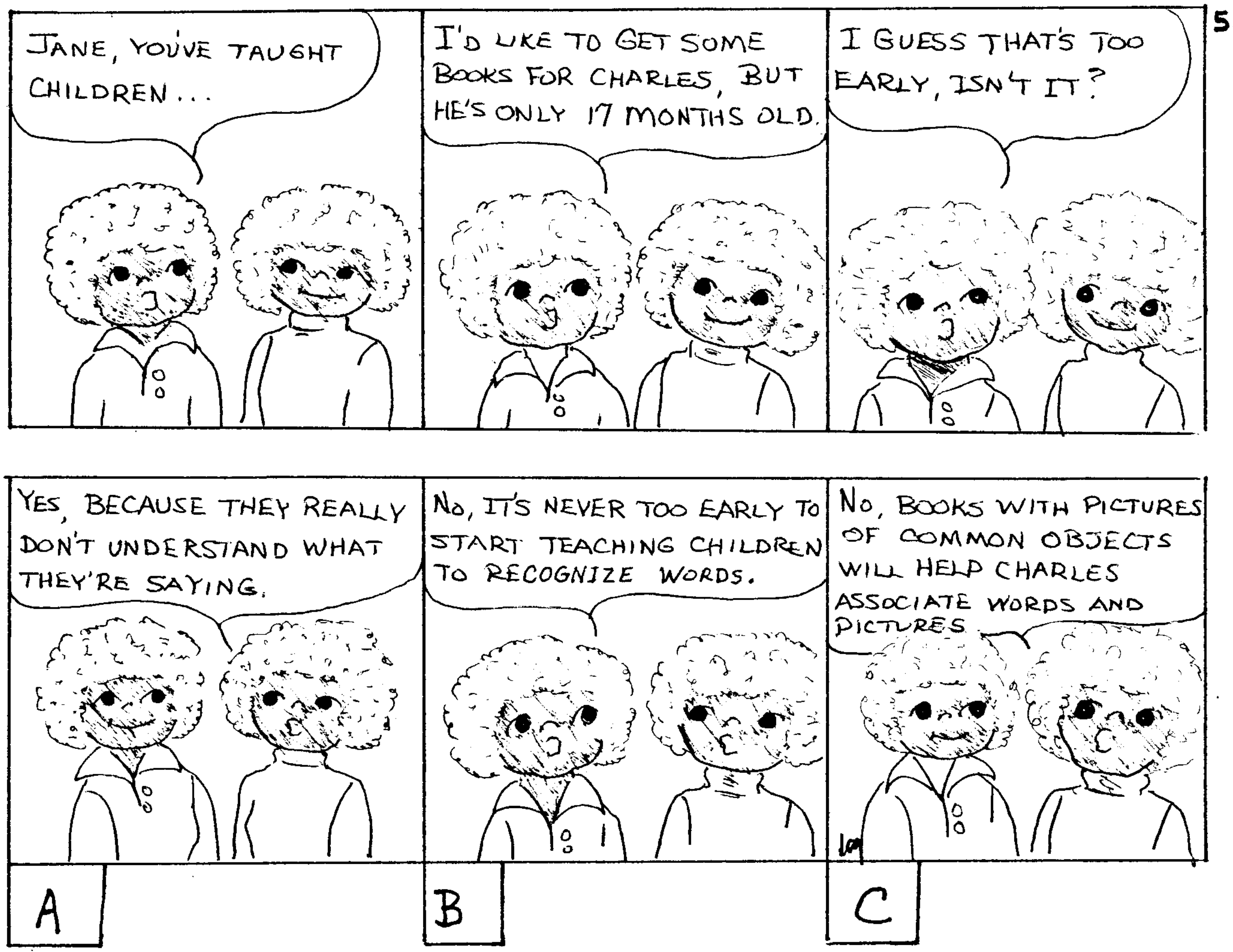

2.
POOR ALEX DOESN'T LIKE TO HAVE HIS DIAPER CHANGED.
I WISH I COULD THINK OF SOME WAY...
...THAT WOULD MAKE IT EASIER FOR BOTH OF US.
WHY NOT TICKLE PARTS OF HIS BODY WHILE NAMING THEM?
HE WON'T CRY IF YOU DON'T TAKE MUCH TIME.
HOLD HIM FIRMLY AND TALK TO HIM TO REASSURE HIM.
A
B
C

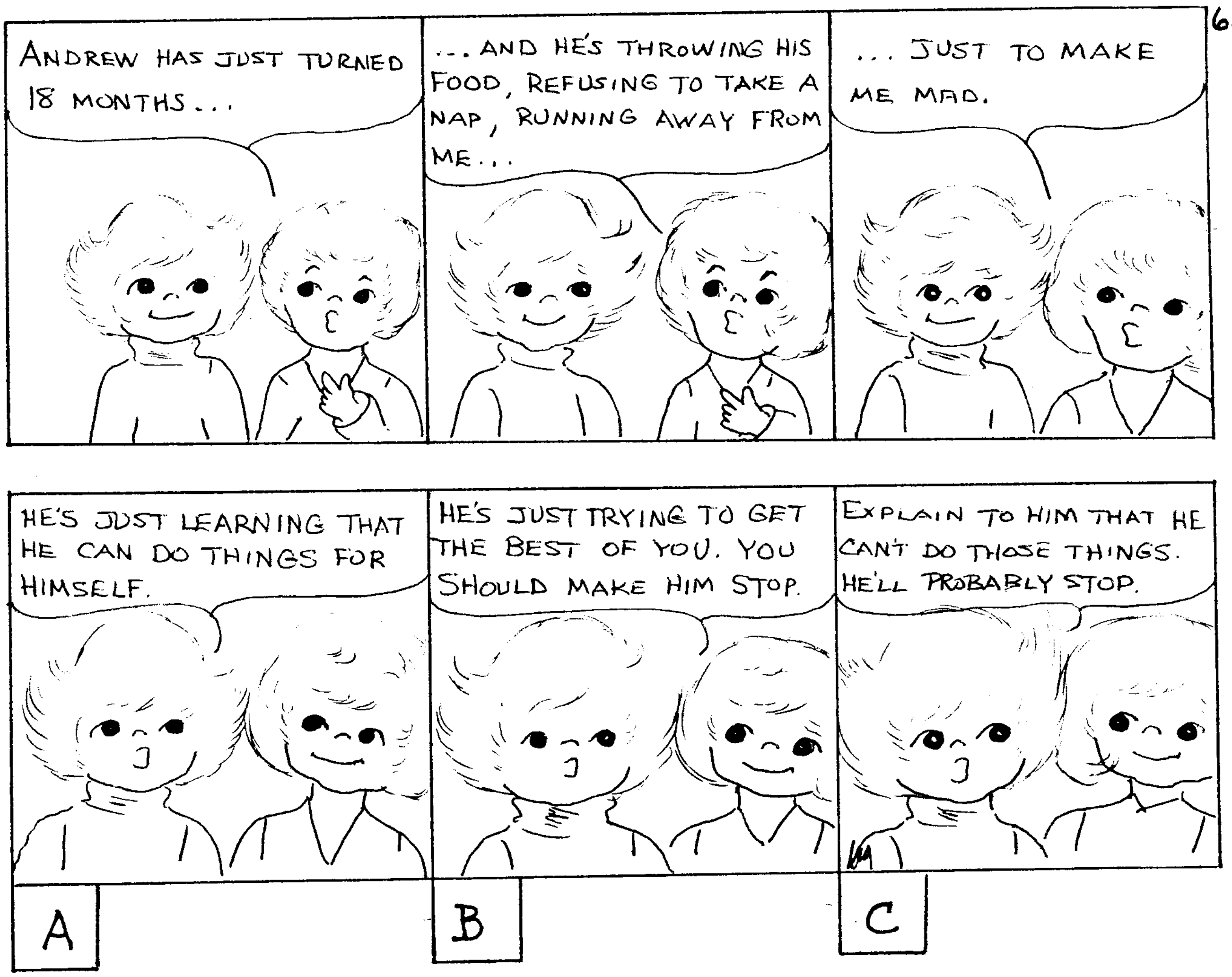
3.


JOHNNY LIKES TO WATCH THE MOBILE MOVE.
I GUESS JOHNNY KNEW WHAT HE WAS DOING ALL ALONG.
JOHNNY GOT THE MOBILE TO MOVE BY ACCIDENT AND WON'T DO IT AGAIN.
JOHNNY HAS FOUND OUT THAT HE CAN MAKE OBJECTS DO THINGS THAT ARE FUN.
A
B
C

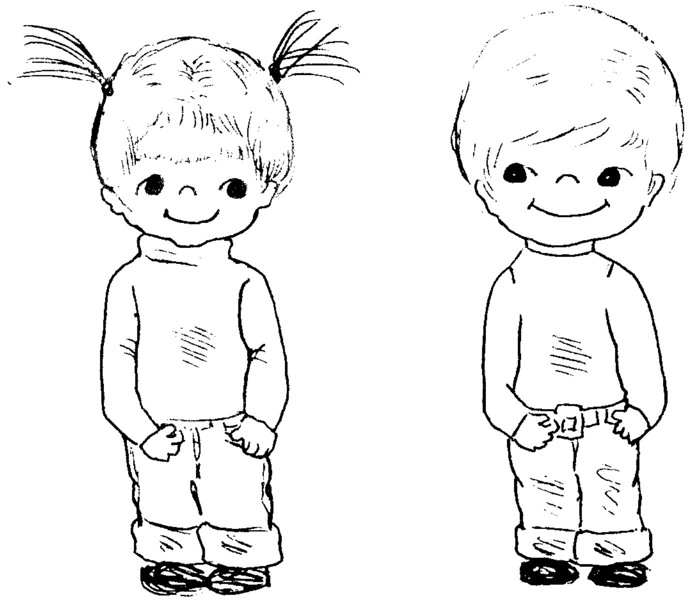
4.


HERE WENDY, DON'T CRY.
IT WAS RIGHT BEHIND YOU.
I WONDER HOW I CAN HELP WENDY LEARN TO LOOK FOR OBJECTS.
I COULD HIDE A TOY AND ASK HER TO FIND IT.
I COULD PUT A STRING ON A TOY AND LET HER PULL IT.
I COULD SHOW HER PICTURES AND ASK HER TO TELL ME THE NAMES OF THINGS.
A
B
C

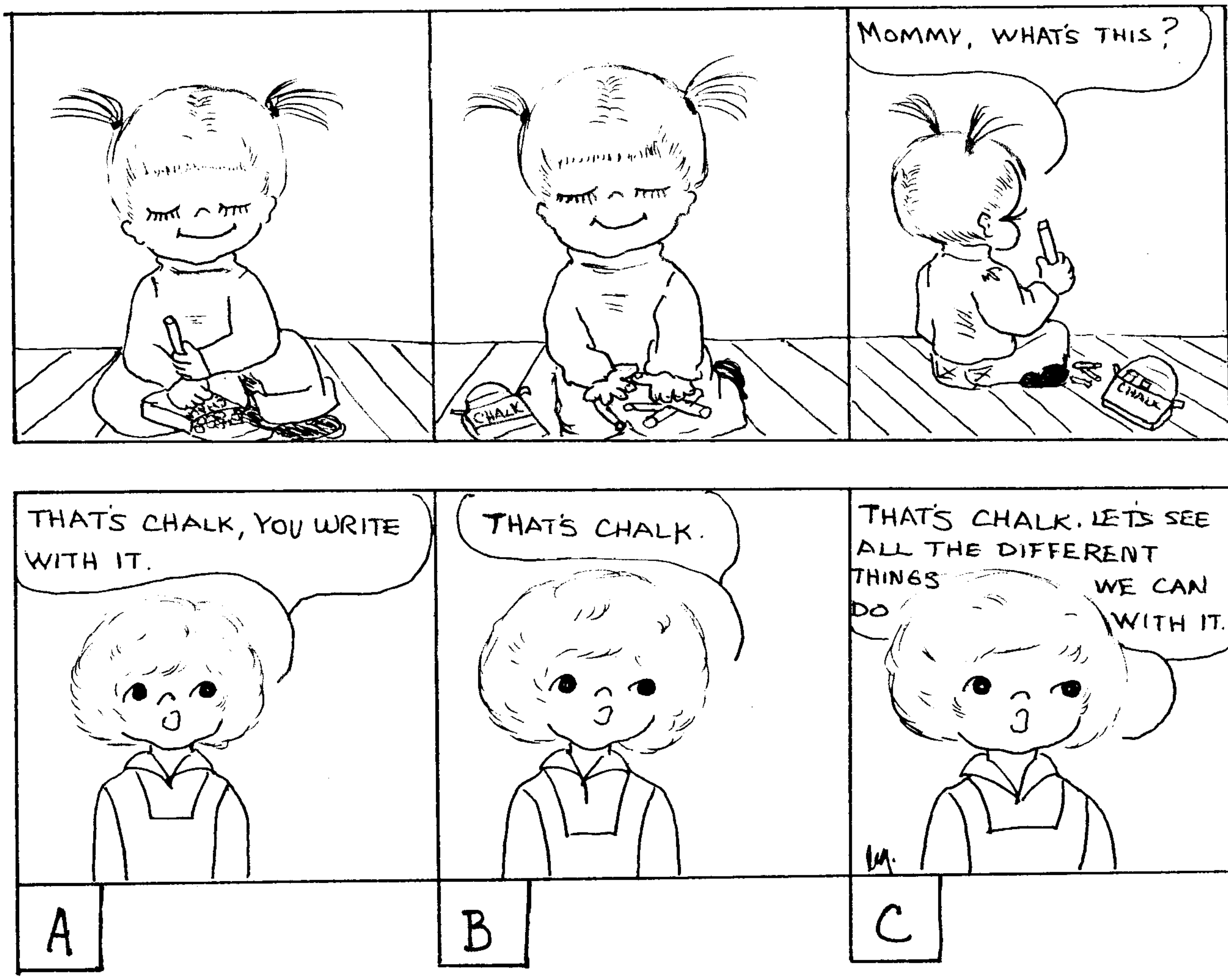

5.
JANE, YOU'VE TAUGHT CHILDREN...
I'D LIKE TO GET SOME BOOKS FOR CHARLES, BUT HE'S ONLY 17 MONTHS OLD.
I GUESS THAT'S TOO EARLY, ISN'T IT?
YES, BECAUSE THEY REALLY DON'T UNDERSTAND WHAT THEY'RE SAYING.
NO, IT'S NEVER TOO EARLY TO START TEACHING CHILDREN TO RECOGNIZE WORDS.
NO, BOOKS WITH PICTURES OF COMMON OBJECTS WILL HELP CHARLES ASSOCIATE WORDS AND PICTURES
A
B
C


6.
ANDREW HAS JUST TURNED 18 MONTHS...
...AND HE'S THROWING HIS FOOD, REFUSING TO TAKE A NAP, RUNNING AWAY FROM ME...
... JUST TO MAKE ME MAD.
HE'S JUST LEARNING THAT HE CAN DO THINGS FOR HIMSELF.
HE'S JUST TRYING TO GET THE BEST OF YOU. YOU SHOULD MAKE HIM STOP.
EXPLAIN TO HIM THAT HE CAN'T DO THOSE THINGS. HE'LL PROBABLY STOP.
A
B
C

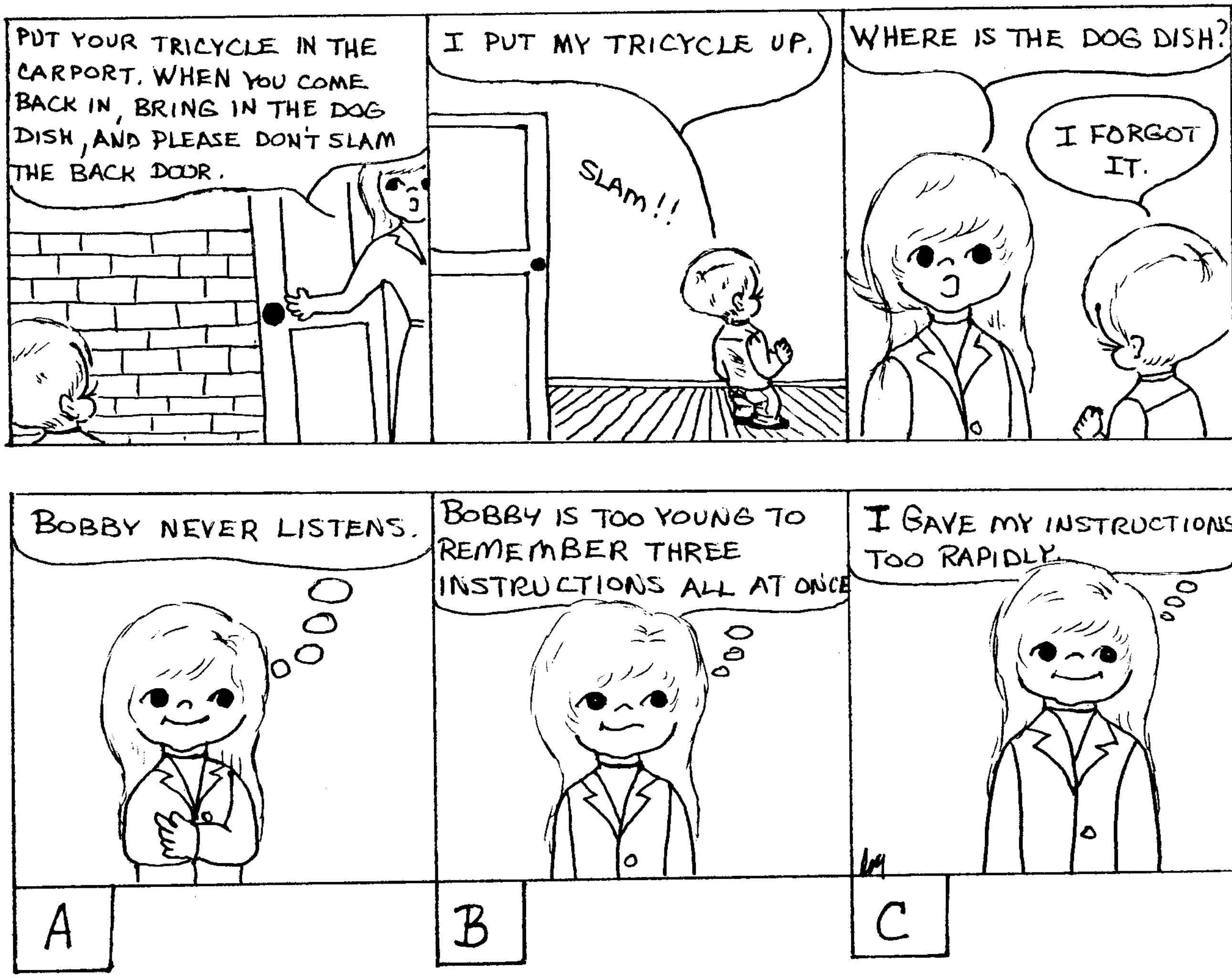
NOW LET'S THINK ABOUT A THREE YEAR OLD.



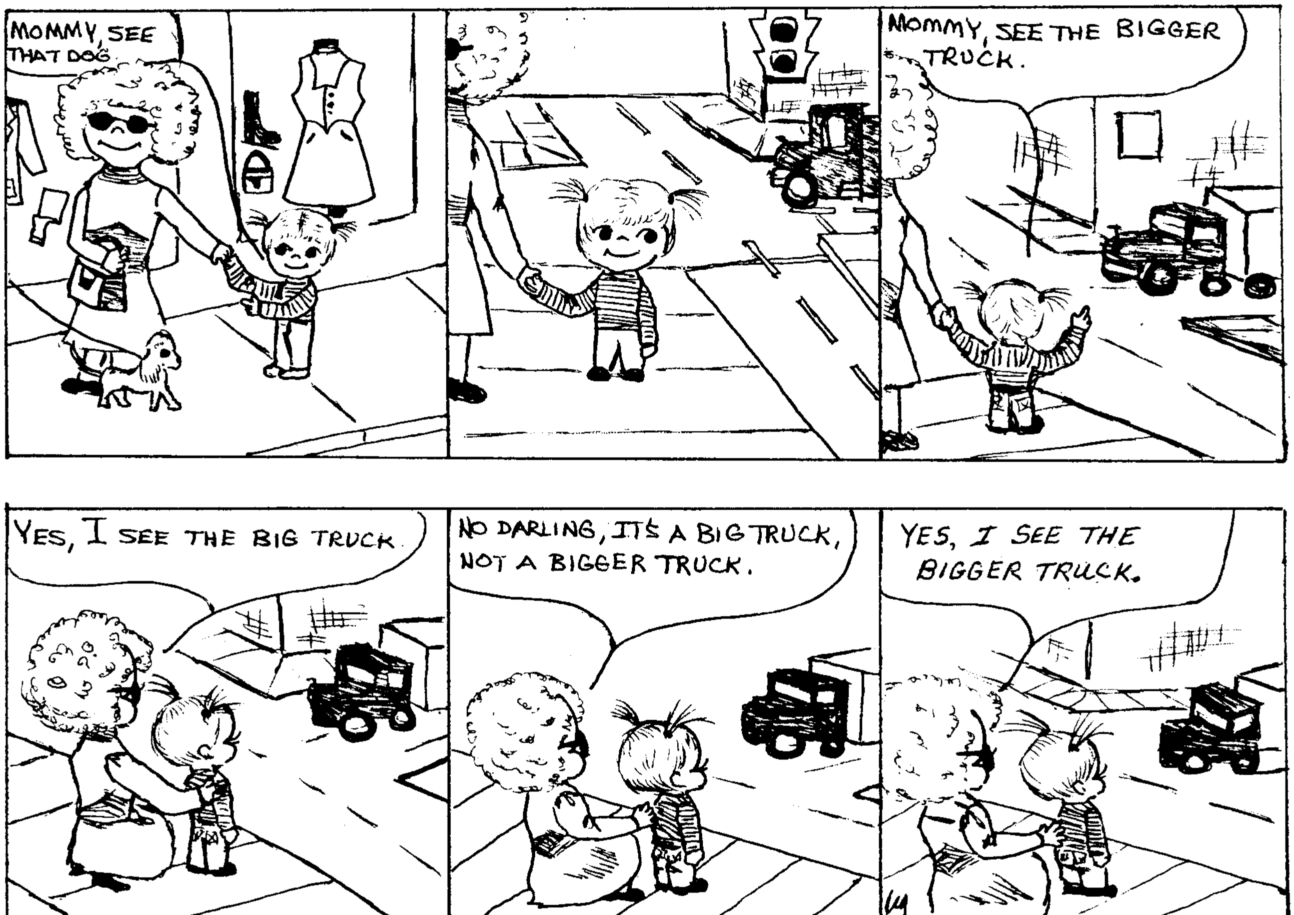
7.


MOMMY, WHAT'S THIS?
CHALK
THAT'S CHALK, YOU WRITE WITH IT.
THAT'S CHALK.
THAT'S CHALK. LET'S SEE ALL THE DIFFERENT THINGS WE CAN DO WITH IT.
A
B
C

8.


PUT YOUR TRICYCLE IN THE CARPORT. WHEN YOU COME BACK IN, BRING IN THE DOG DISH, AND PLEASE DON'T SLAM THE BACK DOOR.
I PUT MY TRICYCLE UP.
SLAM!!
WHERE IS THE DOG DISH?
I FORGOT IT.
BOBBY NEVER LISTENS.
BOBBY IS TOO YOUNG TO REMEMBER THREE INSTRUCTIONS ALL AT ONCE
I GAVE MY INSTRUCTIONS TOO RAPIDLY.
A
B
C

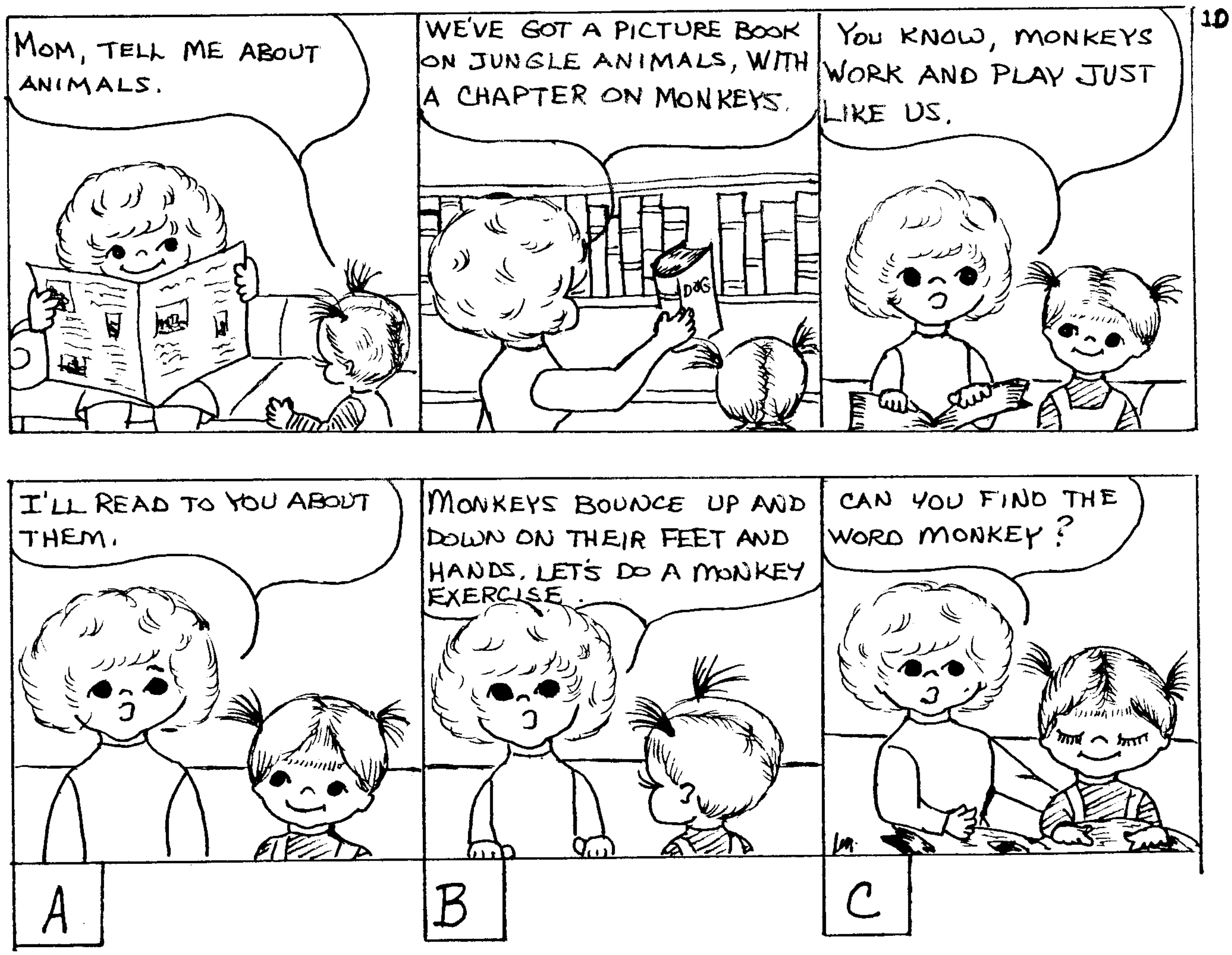
9.


MOMMY, SEE THAT DOG.
MOMMY, SEE THE BIGGER TRUCK.
YES, I SEE THE BIG TRUCK.
NO DARLING, IT'S A BIG TRUCK, NOT A BIGGER TRUCK.
YES, I SEE THE BIGGER TRUCK.

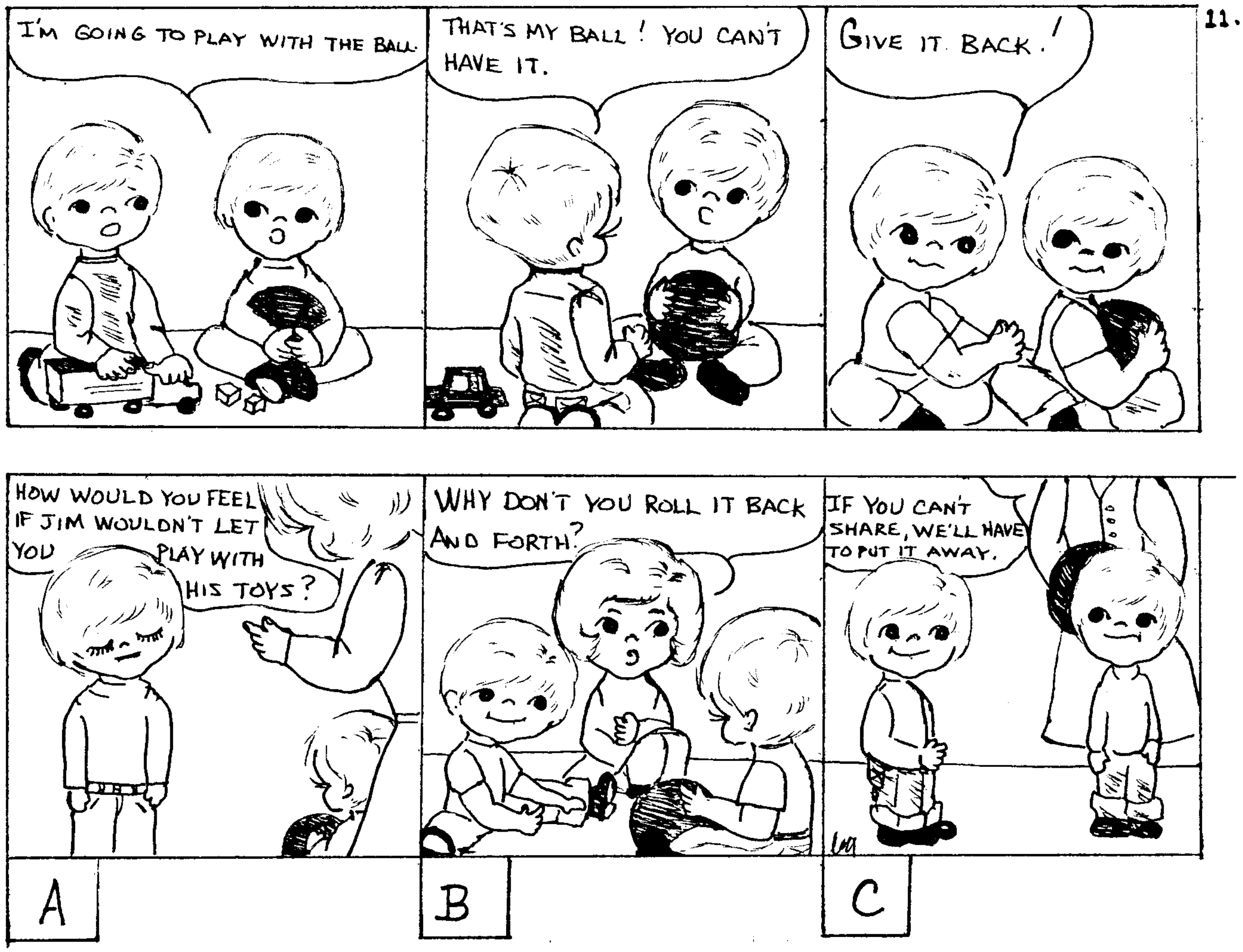
A

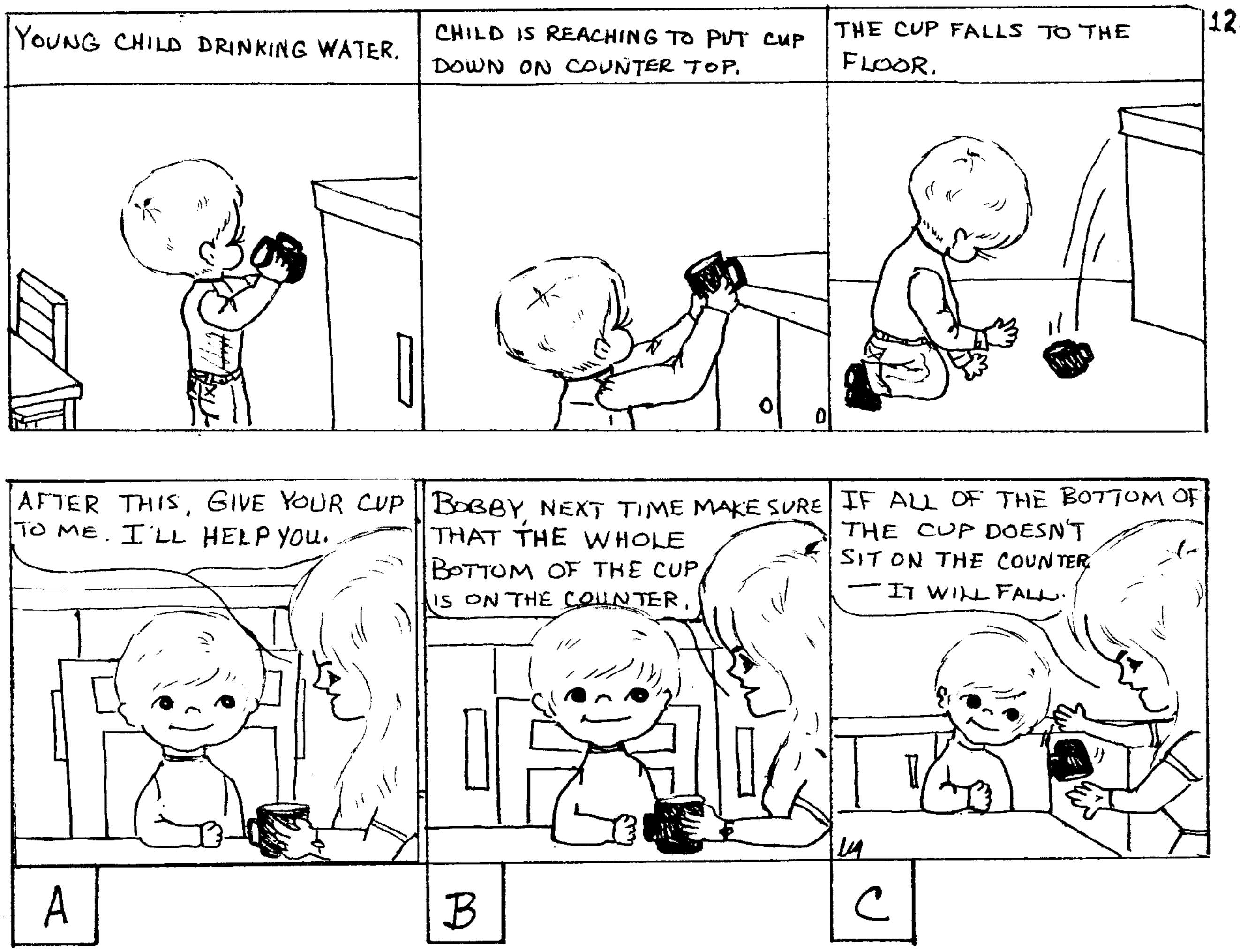
B

C

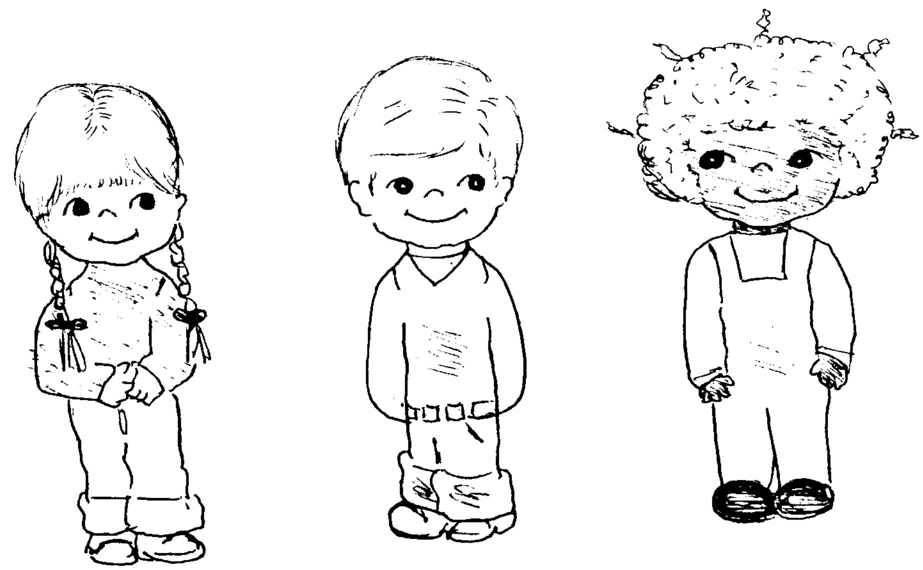

10.
MOM, TELL ME ABOUT ANIMALS.
WE'VE GOT A PICTURE BOOK ON JUNGLE ANIMALS, WITH A CHAPTER ON MONKEYS.
DOGS
YOU KNOW, MONKEYS WORK AND PLAY JUST LIKE US.
I'LL READ TO YOU ABOUT THEM.
MONKEYS BOUNCE UP AND DOWN ON THEIR FEET AND HANDS. LET'S DO A MONKEY EXERCISE.
CAN YOU FIND THE WORD MONKEY?
A
B
C

11.

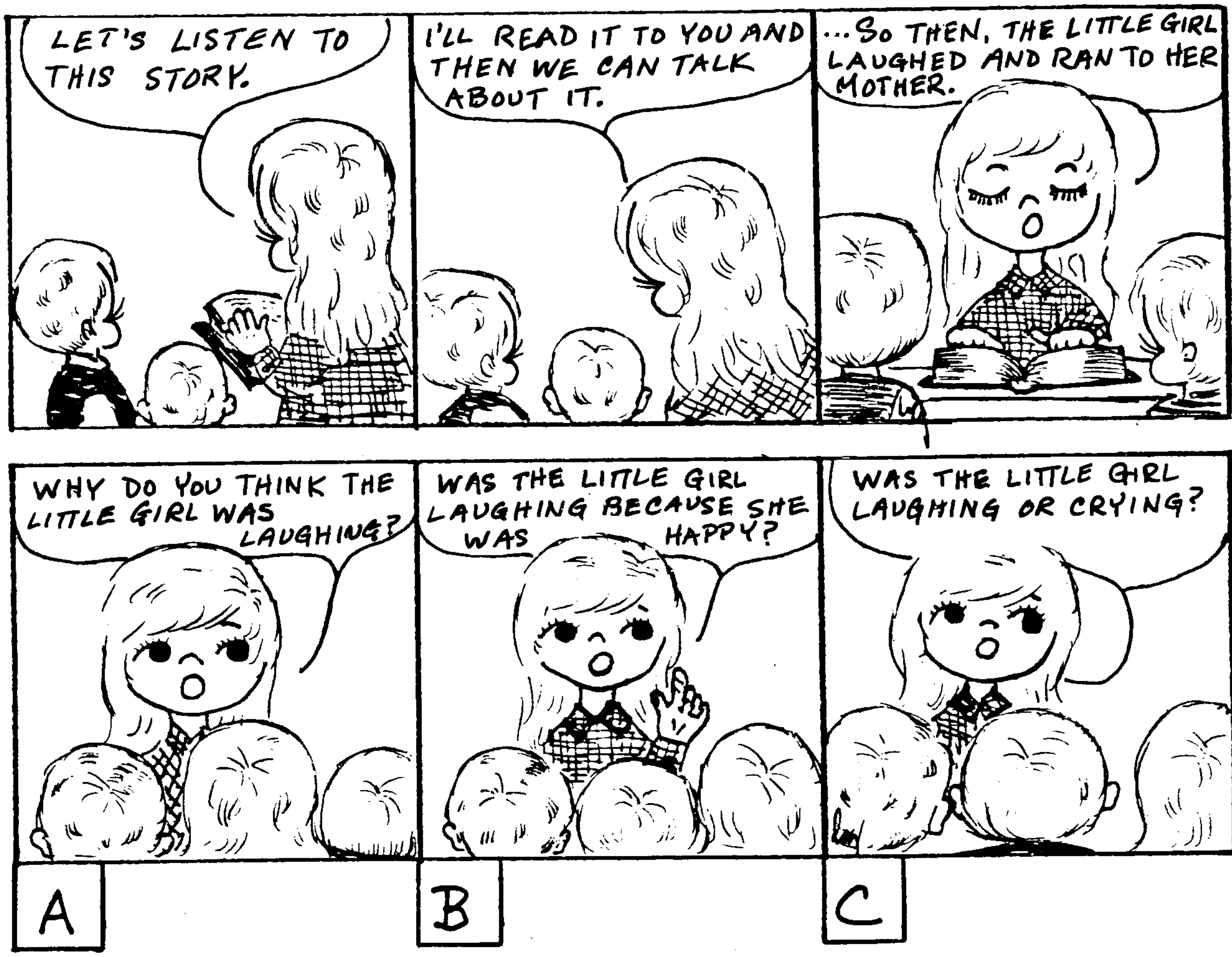

I'M GOING TO PLAY WITH THE BALL.
THAT'S MY BALL! YOU CAN'T HAVE IT.
GIVE IT BACK.!
HOW WOULD YOU FEEL IF JIM WOULDN'T LET YOU PLAY WITH HIS TOYS?
WHY DON'T YOU ROLL IT BACK AND FORTH?
IF YOU CAN'T SHARE, WE'LL HAVE TO PUT IT AWAY.
A
B
C

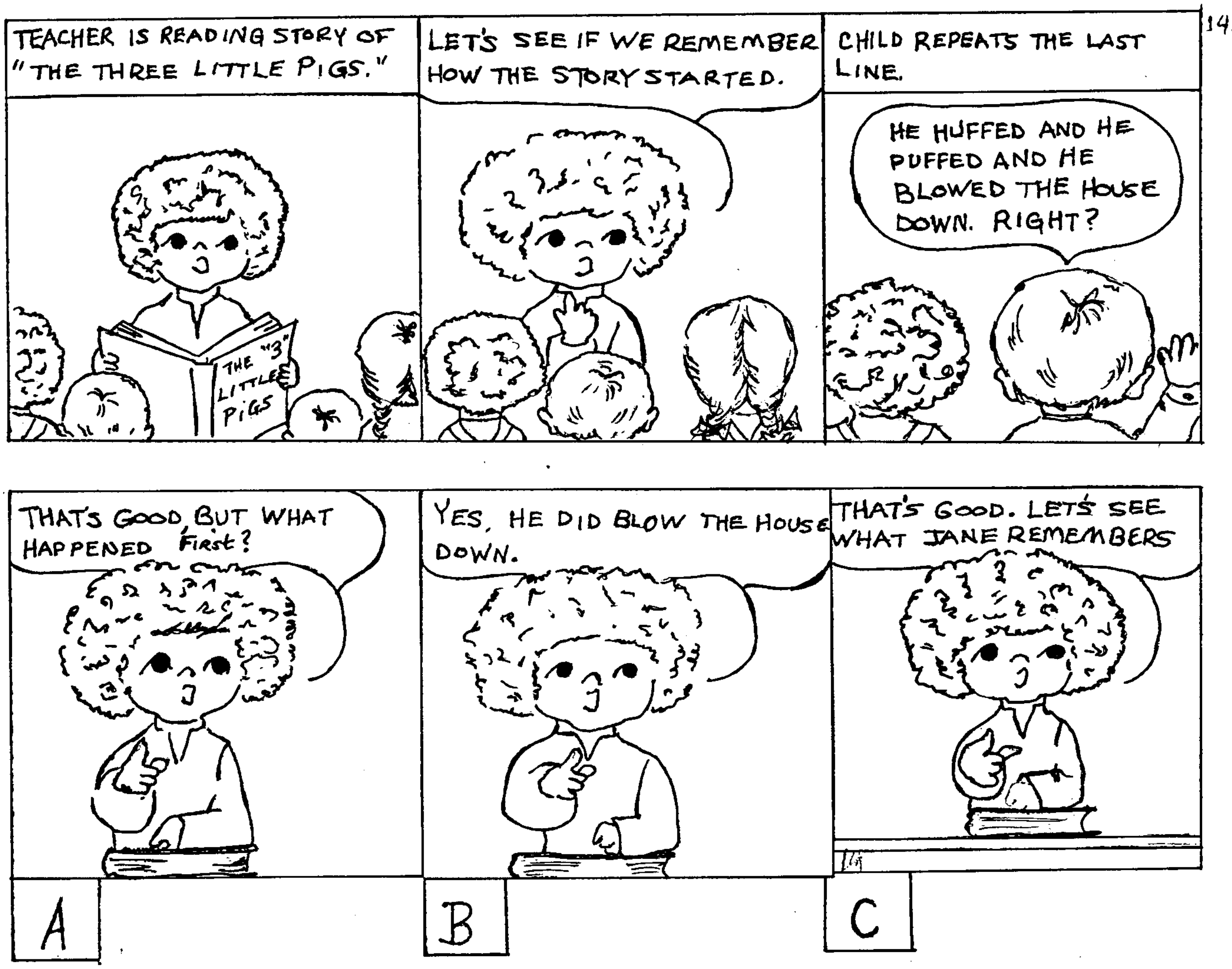

12.
YOUNG CHILD DRINKING WATER.
CHILD IS REACHING TO PUT CUP DOWN ON COUNTER TOP.
THE CUP FALLS TO THE FLOOR.
AFTER THIS, GIVE YOUR CUP TO ME. I'LL HELP YOU.
BOBBY, NEXT TIME MAKE SURE THAT THE WHOLE BOTTOM OF THE CUP IS ON THE COUNTER.
IF ALL OF THE BOTTOM OF THE CUP DOESN'T SIT ON THE COUNTER — IT WILL FALL.
A
B
C

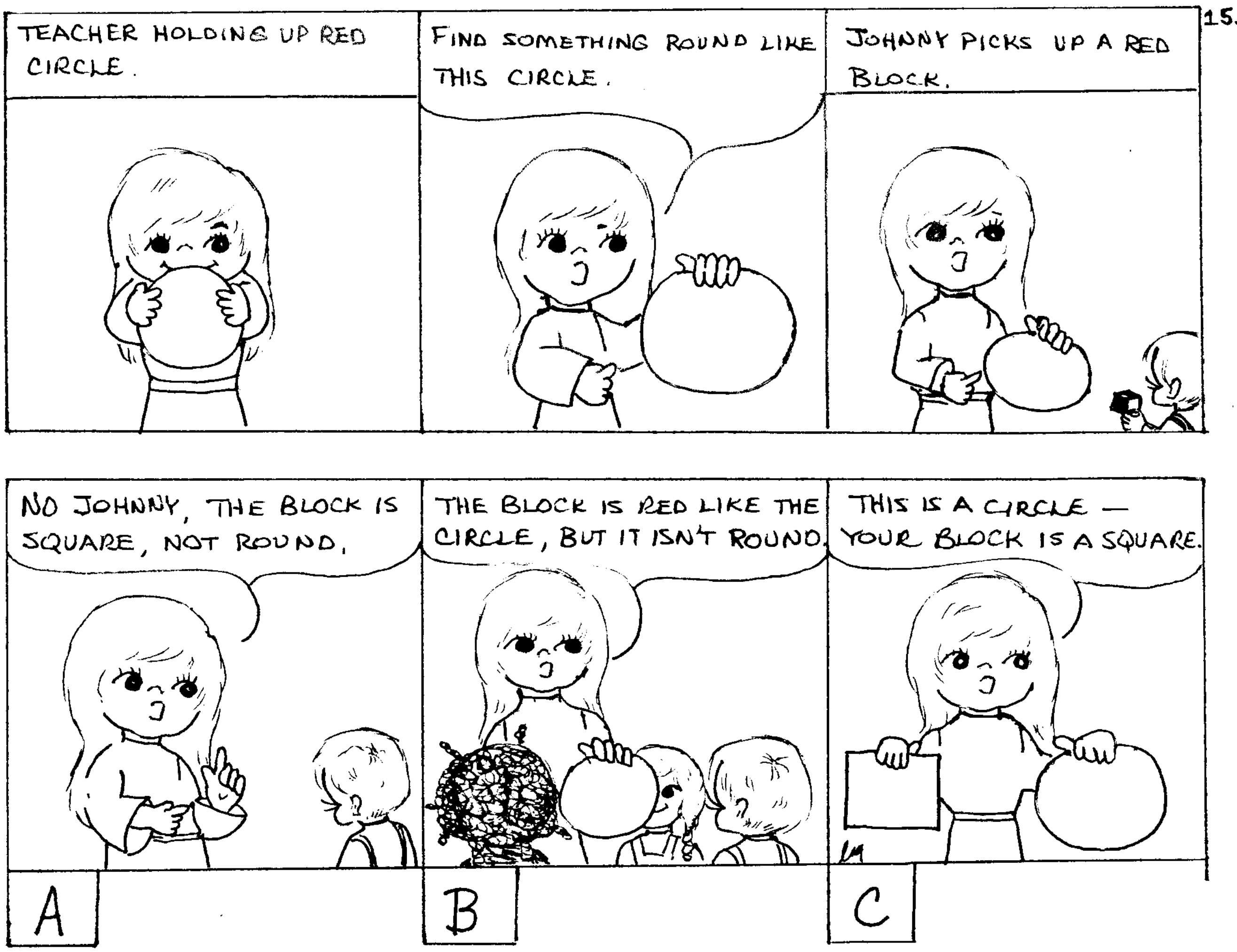
NOW LET'S THINK ABOUT A FOUR YEAR OLD.



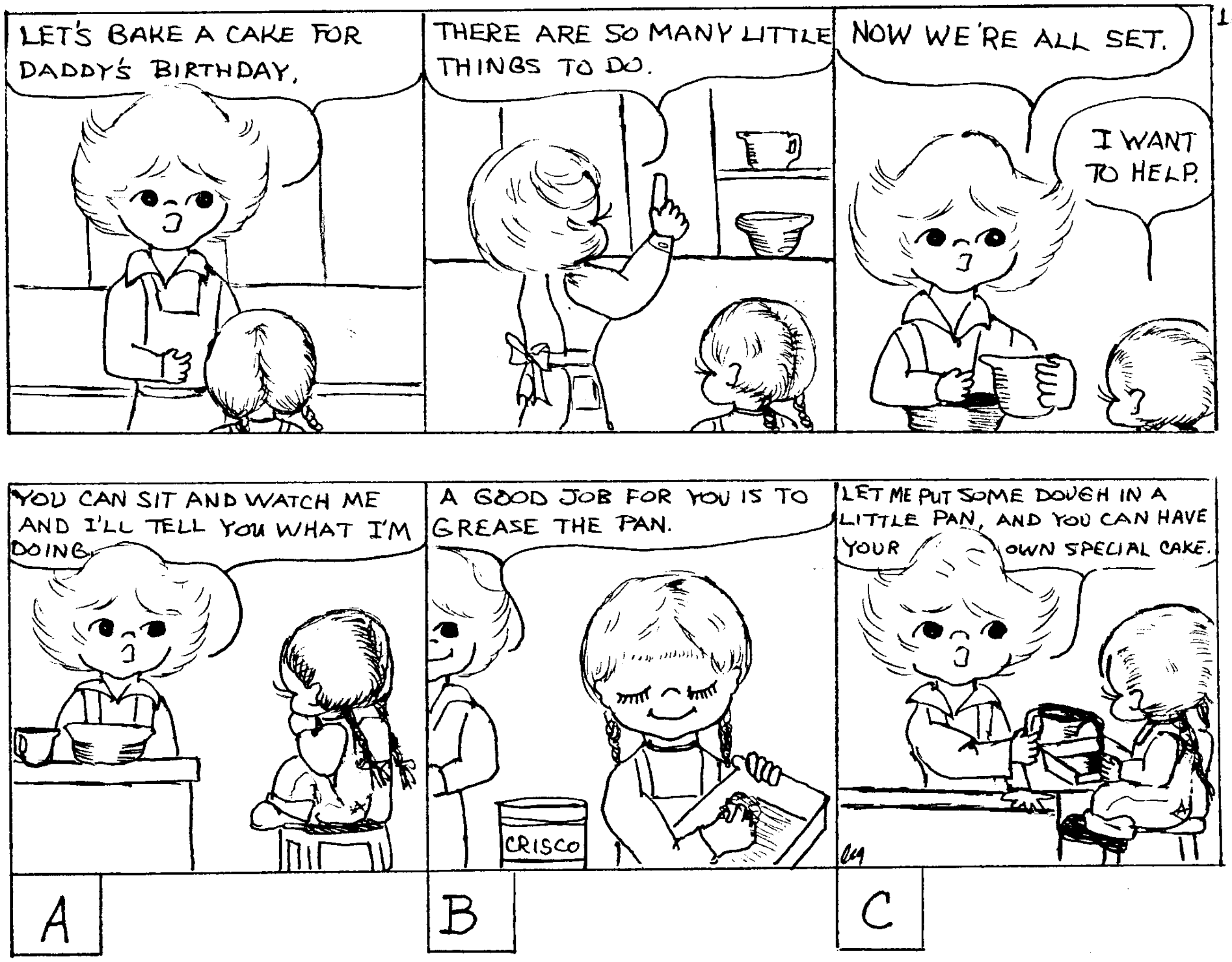
13.


LET'S LISTEN TO THIS STORY.
I'LL READ IT TO YOU AND THEN WE CAN TALK ABOUT IT.
...SO THEN, THE LITTLE GIRL LAUGHED AND RAN TO HER MOTHER.
WHY DO YOU THINK THE LITTLE GIRL WAS LAUGHING?
WAS THE LITTLE GIRL LAUGHING BECAUSE SHE WAS HAPPY?
WAS THE LITTLE GIRL LAUGHING OR CRYING?
A
B
C


14.
TEACHER IS READING STORY OF "THE THREE LITTLE PIGS."
THE "3" LITTLE PIGS
LET'S SEE IF WE REMEMBER HOW THE STORY STARTED.
CHILD REPEATS THE LAST LINE.
HE HUFFED AND HE PUFFED AND HE BLOWED THE HOUSE DOWN. RIGHT?
THAT'S GOOD, BUT WHAT HAPPENED First?
YES, HE DID BLOW THE HOUSE DOWN.
THAT'S GOOD. LET'S SEE WHAT JANE REMEMBERS
A
B
C

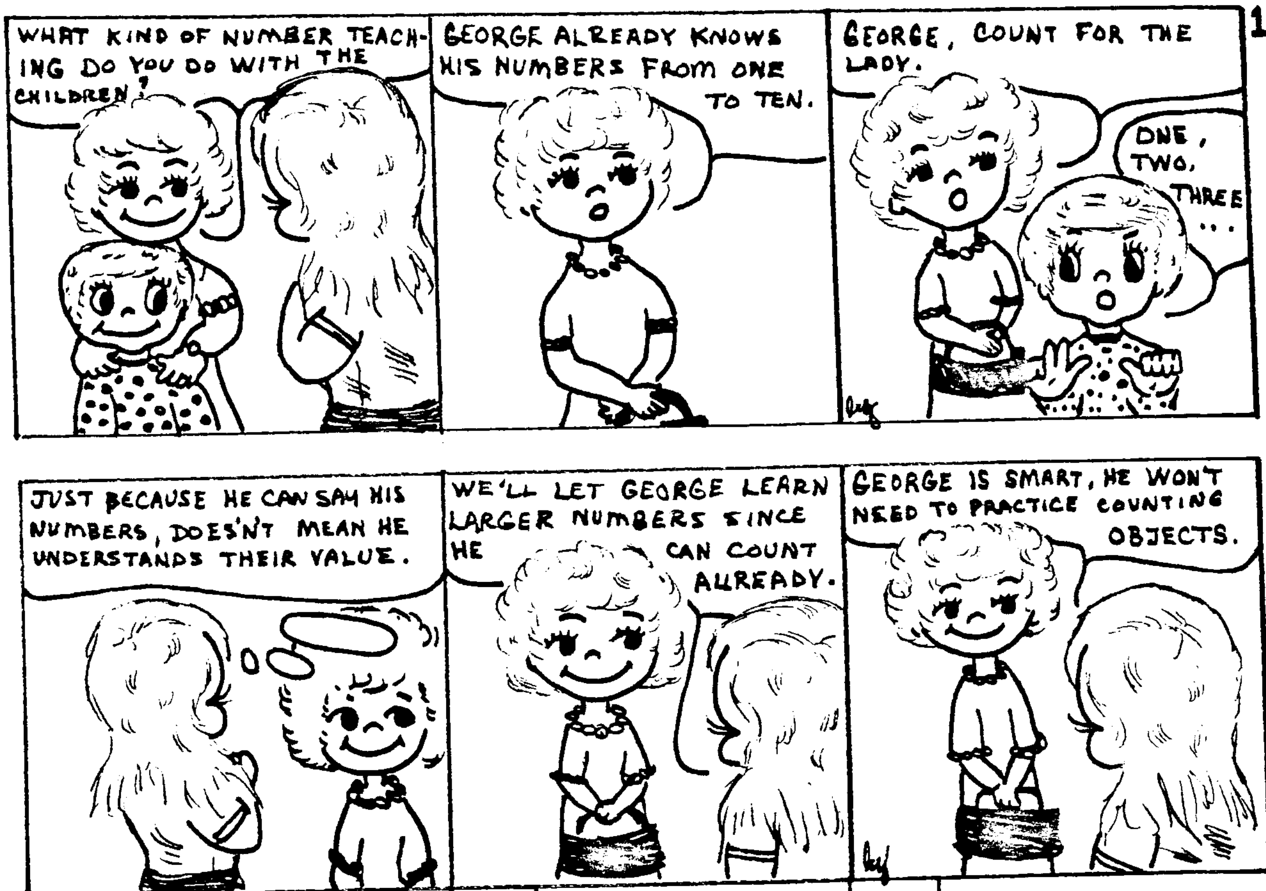

15.
TEACHER HOLDING UP RED CIRCLE.
FIND SOMETHING ROUND LIKE THIS CIRCLE.
JOHNNY PICKS UP A RED BLOCK.
NO JOHNNY, THE BLOCK IS SQUARE, NOT ROUND.
THE BLOCK IS RED LIKE THE CIRCLE, BUT IT ISN'T ROUND.
THIS IS A CIRCLE — YOUR BLOCK IS A SQUARE.
A
B
C

16.



LET'S BAKE A CAKE FOR DADDY'S BIRTHDAY.
THERE ARE SO MANY LITTLE THINGS TO DO.
NOW WE'RE ALL SET.
I WANT TO HELP.
YOU CAN SIT AND WATCH ME AND I'LL TELL YOU WHAT I'M DOING.
A GOOD JOB FOR YOU IS TO GREASE THE PAN.
CRISCO
LET ME PUT SOME DOUGH IN A LITTLE PAN, AND YOU CAN HAVE YOUR OWN SPECIAL CAKE.
A
B
C

17.

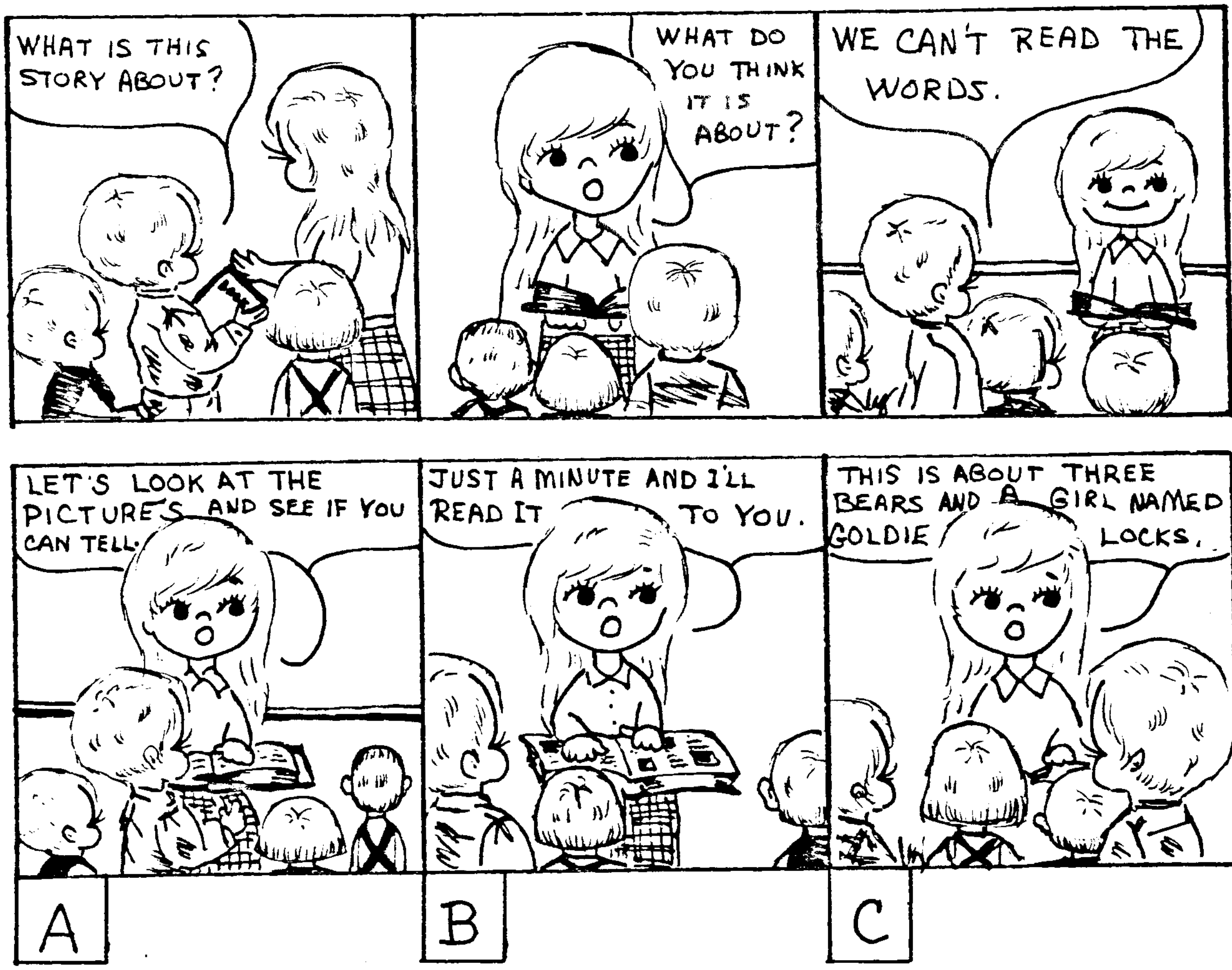

WHAT KIND OF NUMBER TEACHING DO YOU DO WITH THE CHILDREN?
GEORGE ALREADY KNOWS HIS NUMBERS FROM ONE TO TEN.
GEORGE, COUNT FOR THE LADY.
ONE, TWO, THREE ...
JUST BECAUSE HE CAN SAY HIS NUMBERS, DOES'NT MEAN HE UNDERSTANDS THEIR VALUE.
WE'LL LET GEORGE LEARN LARGER NUMBERS SINCE HE CAN COUNT ALREADY.
GEORGE IS SMART, HE WON'T NEED TO PRACTICE COUNTING OBJECTS.

A

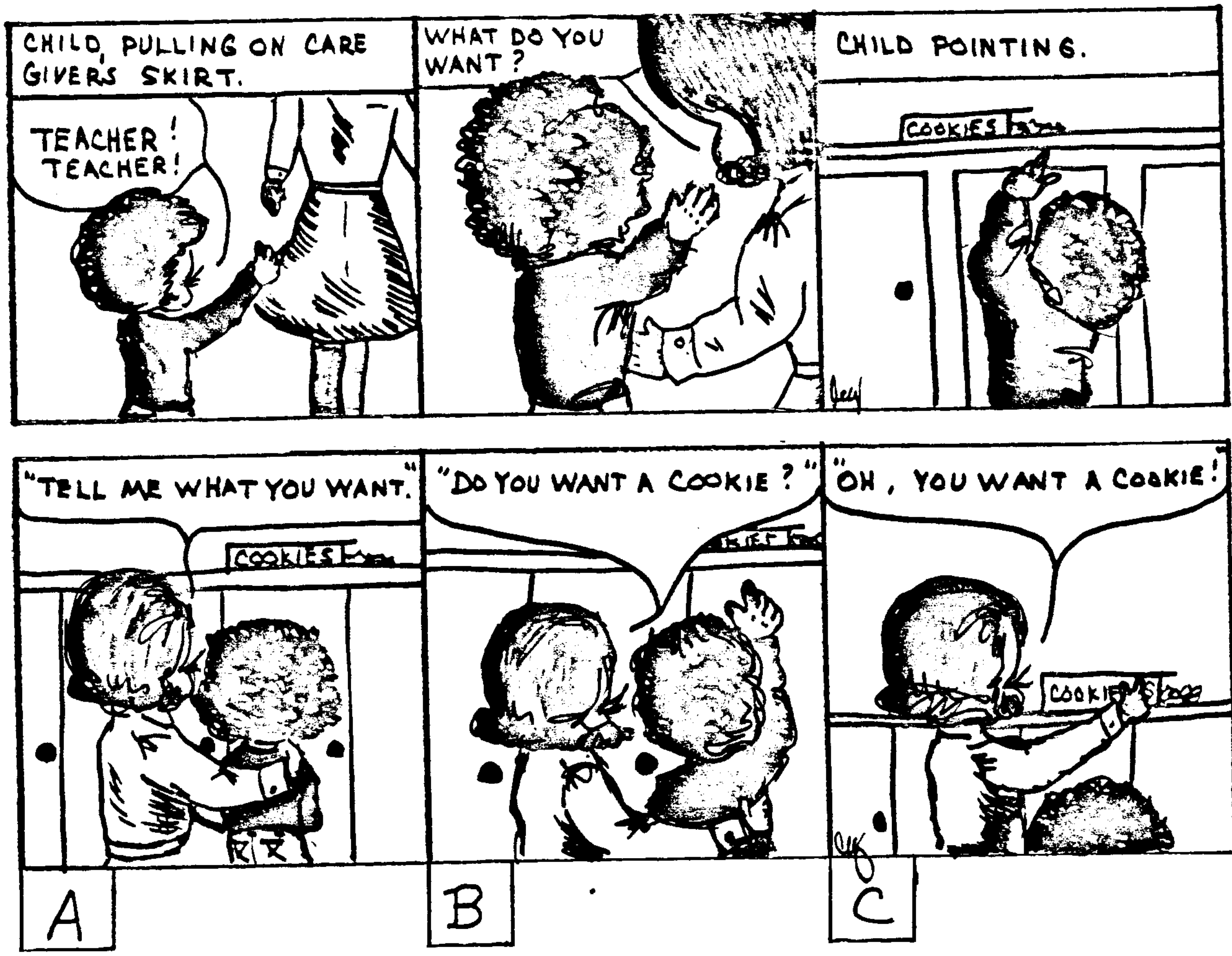
B

C

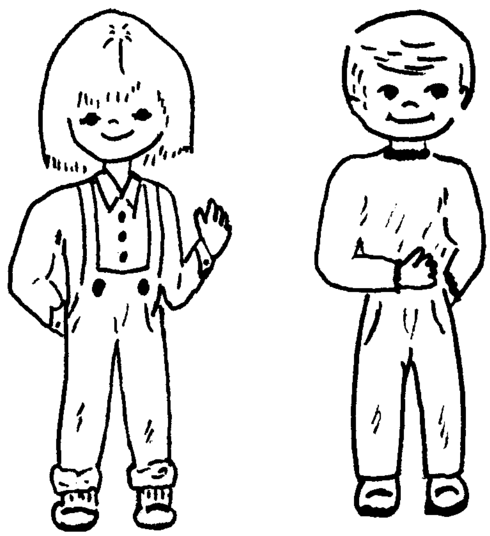
18.


WHAT IS THIS STORY ABOUT?
WHAT DO YOU THINK IT IS ABOUT?
WE CAN'T READ THE WORDS.
LET'S LOOK AT THE PICTURES AND SEE IF YOU CAN TELL.
JUST A MINUTE AND I'LL READ IT TO YOU.
THIS IS ABOUT THREE BEARS AND A GIRL NAMED GOLDIE LOCKS.
A
B
C

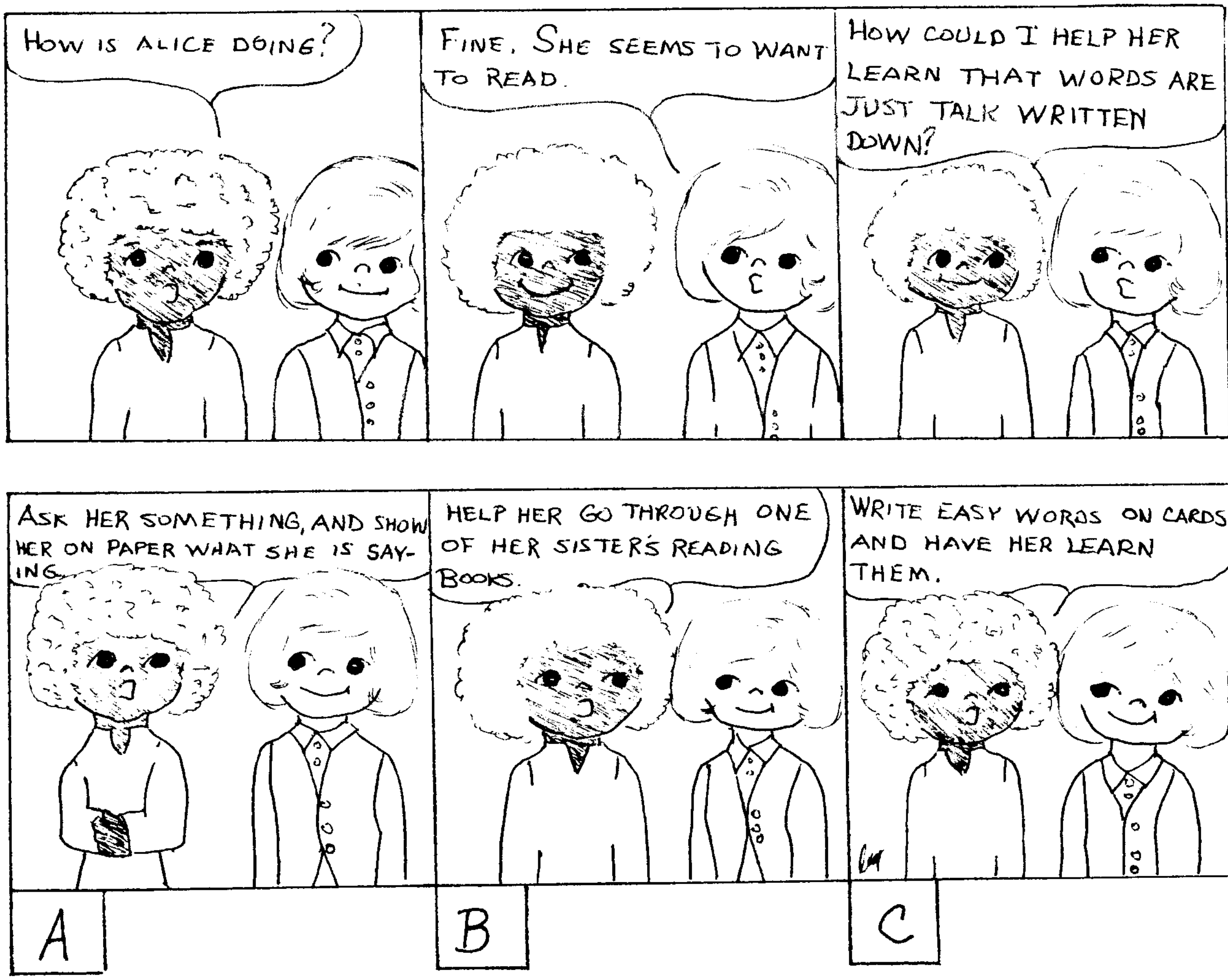
19.


CHILD, PULLING ON CARE GIVER'S SKIRT.
TEACHER! TEACHER!
WHAT DO YOU WANT?
CHILD POINTING.
COOKIES
"TELL ME WHAT YOU WANT."
COOKIES
A
"DO YOU WANT A COOKIE?"
B
"OH, YOU WANT A COOKIE!"
COOKIES
C

NOW LET'S THINK ABOUT A FIVE YEAR OLD.



20.


HOW IS ALICE DOING?
FINE. SHE SEEMS TO WANT TO READ.
HOW COULD I HELP HER LEARN THAT WORDS ARE JUST TALK WRITTEN DOWN?
ASK HER SOMETHING, AND SHOW HER ON PAPER WHAT SHE IS SAY-ING.
HELP HER GO THROUGH ONE OF HER SISTER'S READING BOOKS.
WRITE EASY WORDS ON CARDS AND HAVE HER LEARN THEM.
A
B
C

SDP # | | | | | | | | | | |

ID # | | | | | | | | | | | | | | | |

RA | | |

FACE SHEET

SITUATIONS BOOKLET

NOTE: This booklet is for caregivers and parents.

DATE: | | | | | | |
MO DAY YR

TIME: A. | | | | | |

B. A.M. 1

P.M. 2

tear line

PARENT'S OR CAREGIVER'S NAME

1. A child has been promised a trip to the store to buy some chocolate ice cream. His mother plans to go in about two hours, after the child's rest or "quiet time." The child wants to know when they are going to the store.

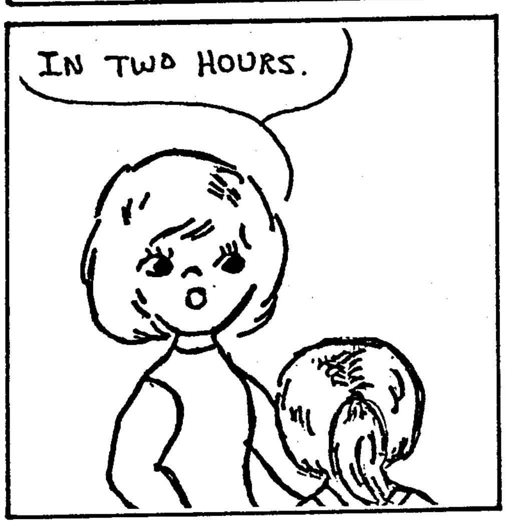
Which answer would you give to what age child? For each answer below, indicate the age of the child to which you would give that answer.

A.

Age of the Child

____

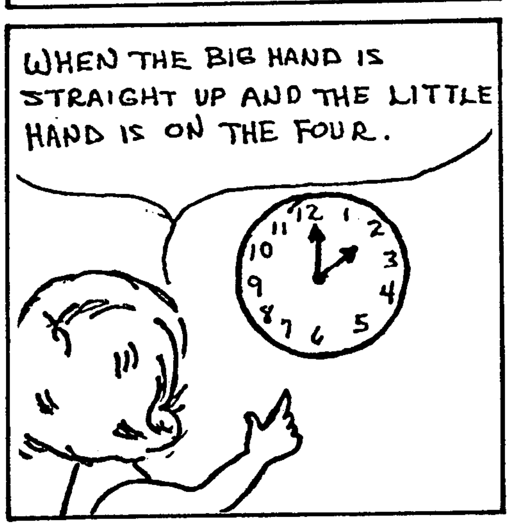
B.



Age of the Child

____

C.



Age of the Child

____

2. Each of three children, Lisa, Penny, and Edward, is given the same collection of shapes: four squares, four circles, and three triangles. Two of the squares, two of the circles, and one triangle are red; two of the squares, two of the circles, and two of the triangles are white.

The children are asked to put together those objects which are like each other. On the opposite page, you can see what the children did with the shapes.

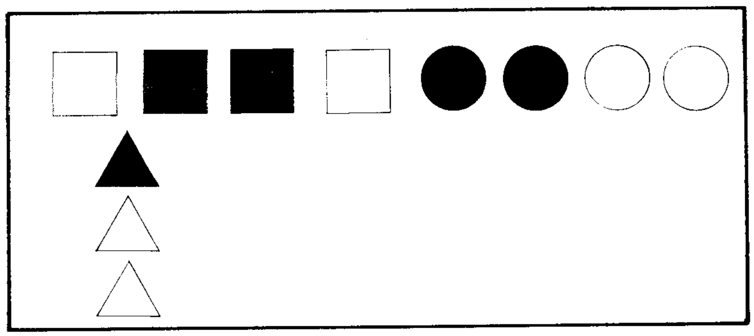
On the basis of how they grouped the shapes, how old do you think each child is? Fill in an age for each of the three children.

A. Lisa is about_____________years old.

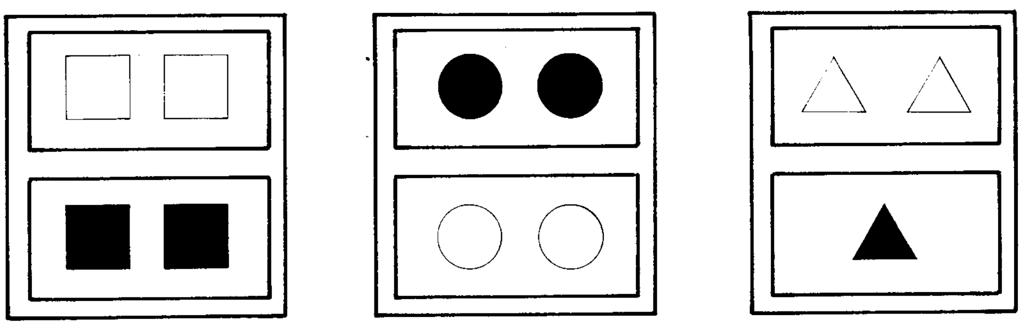
B. Penny is about_____________years old.

C. Edward is about______________years old.

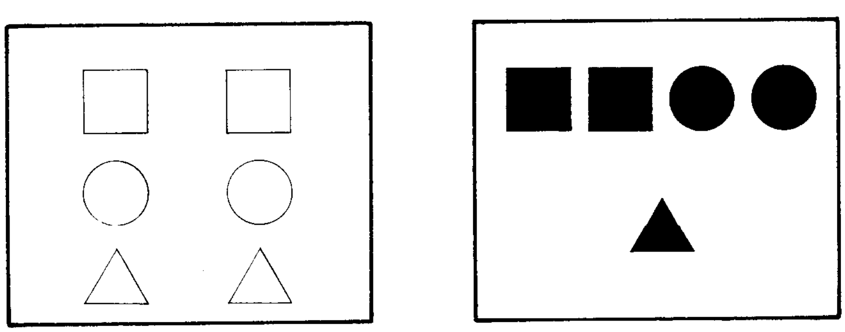
LISA



PENNY



EDWARD



* * * * * * * * * *

In discussions of child development, there are several words which describe different skills which children have or acquire. The following questions ask about these skills. In answering each question, choose that word from this list which seems most appropriate.

1. representation
2. seriation
3. reversibility
4. correspondence
5. object permanence
6. conservation
7. accommodation
8. classification
9. assimilation

3. Thomas is playing with his toy cars, and his mother suggests that he arrange them in a "play" parking lot. Thomas carefully lines up his cars as though they are "parked." His mother then suggests that he take all the cars away and see if he can "park" them again, but in the opposite order.

   What ability does this task take? How old will Thomas have to be before he is apt to have this ability?

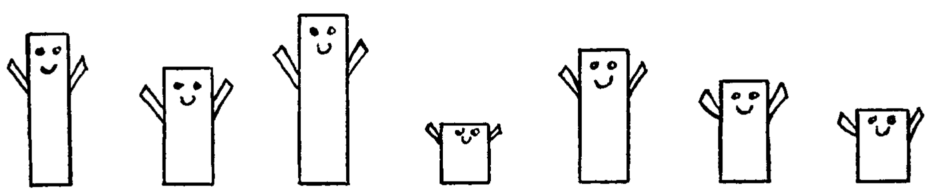
   A. The ability is____________________________________

   ____

   B. Thomas will probably not have this ability before the age of

   ________years.

4. Mary is given a set of seven "stick" dolls.



   Each doll is a different height than the other dolls. Mary is asked to arrange her set of dolls in order of height, with the Daddy doll first.

   What ability does this task take? How old will Mary have to be to complete the task without having to use unsystematic trial and error?

   A. The ability is____________________________________

   ____

   B. Mary will probably not have this ability before the age of

   ________years.

5. Jennie has a toy farm, including a "herd" of toy cows. One afternoon she and her mother are playing with the farm. Jennie's mother lines up the cows in a row. She then gets some toothpicks from the kitchen and asks Jennie to put a toothpick in front of each cow.

   A. What ability is Jennie's mother trying to teach Jennie?

   ____

   ____

   B. Jennie will probably not have this ability before the age of

   ___________years.

6. Laura is watching her mother make a pie crust. After showing Laura the ball of dough, Laura's mother rolls it out into a flat "pancake." She then asks Laura if the "pancake" has the same amount of dough as the ball.

   A. What ability is Laura's mother trying to teach Laura? __________

   ____

   B. Laura will probably not have this ability before the age of

   ___________years.

SDP # | | | | | | | | | | |

ID # | | | | | | | | | | | | | | | |

RA | | |

FACE SHEET

CHILDREN'S DEVELOPMENTAL STAGES

DATE: | | | | | | |
MO DAY YR

TIME: A. | | | | | |

B. A.M. 1
P.M. 2

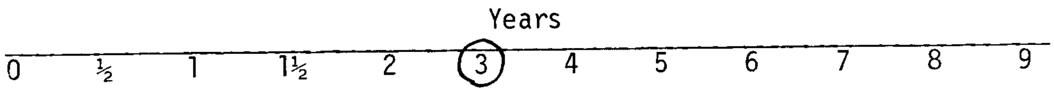
tear line

RESPONDENT'S NAME

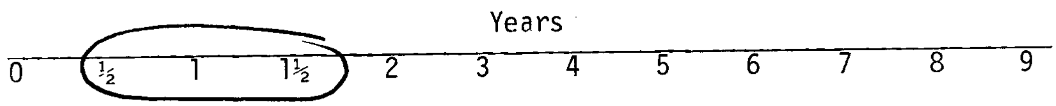
CHARACTERISTICS OF CHILDREN'S DEVELOPMENTAL STAGES

Below is a list of children's behaviors. Each of these is characteristic or typical of a particular stage in the child's development.

Below each behavior are several different ages. For each behavior we would like you to circle the age or age range for which it is typical. For some behaviors you might want to circle one age only, for example,



In other cases, you might want to circle several adjacent ages, for example,



In this case, you are indicating the age range for which the behavior is typical.

1. The child is able to watch something being changed and is able to imagine how to return it to its original state.

Years

0 ½ 1 1½ 2 3 4 5 6 7 8 9

---

2. In his thinking, the child deals with only one characteristic of an object or a situation at a time.

Years

0 ½ 1 1½ 2 3 4 5 6 7 8 9

---

3. The child begins to realize that an object still exists, even though he can no longer see it.

Years

0 ½ 1 1½ 2 3 4 5 6 7 8 9

---

4. The child learns by logic and problem solving, in addition to learning by trial and error.

Years

0 $\frac{1}{2}$ 1 $1\frac{1}{2}$ 2 3 4 5 6 7 8 9

---

5. The child cannot conduct a deliberate search for hidden objects: he finds them in an unplanned way.

Years

0 $\frac{1}{2}$ 1 $1\frac{1}{2}$ 2 3 4 5 6 7 8 9

---

6. The child has the mental development to recognize that he has a personal point of view separate from that of others.

Years

0 $\frac{1}{2}$ 1 $1\frac{1}{2}$ 2 3 4 5 6 7 8 9

---

7. The child is first able to distinguish himself from other persons and objects.

Years

0	½	1	1½	2	3	4	5	6	7	8	9

---

8. The child is able to act out a part in social-dramatic play with his friends, for example, in playing house.

Years

0	½	1	1½	2	3	4	5	6	7	8	9

---

9. The child's thought is dominated by his perceptions, rather than by his physical actions.

Years

0	½	1	1½	2	3	4	5	6	7	8	9

10. When an object falls off a table to the floor, the child continues to stare at where it was on the table.

Years

0	½	1	1½	2	3	4	5	6	7	8	9

---

11. The child clearly has the mental development to understand the idea of co-operation.

Years

0	½	1	1½	2	3	4	5	6	7	8	9

---

12. When given a new toy, the child grasps it, bangs it, tries to put it in his mouth or shakes it.

Years

0	½	1	1½	2	3	4	5	6	7	8	9

---

13. In his thinking, the child can consider more than one characteristic of an object at a time.

Years

0	½	1	1½	2	3	4	5	6	7	8	9

---

14. When asked to put objects in categories, the child responds by building something with them, that is, by arranging them *spatially*. He does not organize them according to shared characteristics.

Years

0	½	1	1½	2	3	4	5	6	7	8	9

---

15. The child has the mental development to understand the concept of stealing as adults understand it.

Years

0	½	1	1½	2	3	4	5	6	7	8	9

SDP # | | | | | | | | | | |

ID # | | | | | | | | | | | | | | | |

RA | | |

FACE SHEET

MEDIA QUESTIONNAIRE

NOTE: This booklet is for caregivers and parents.

DATE: | | | | | | |
MO DAY YR

TIME: A. | | | | | |

B. A.M. 1
P.M. 2

tear line

PARENT'S OR CAREGIVER'S NAME

1

1. Some people watched most of the workshop programs alone, while others watched with one or two friends or co-workers. Did you usually watch alone or with someone else?

ALONE...................1 [*GO TO Q.3*]
WITH SOMEONE ELSE.......2 [*GO TO Q.2*]

2. When you watched with others, did you usually just sit together and listen, or did you talk back and forth about some of the things being said?

JUST LISTENED..........1
TALKED AMONG OURSELVES..2

3. Some participants found that they had other obligations that prevented them from watching very often. Others missed very few programs. Out of the 36 programs, could you tell me how many programs you missed.

[*RECORD THE NUMBER MISSED*] ☐☐

4. Everyone could telephone questions in if they wished, but not many did. People have given us several reasons why they didn't call very often. I'm going to read several of these reasons and ask you to tell me whether this was sometimes a reason you didn't call.

4a. For example, someone said: "I can't use my telephone and still see my television set." Was this a very important reason, a somewhat important reason, or not a reason at all for you?

VERY IMPORTANT REASON........1
SOMEWHAT IMPORTANT REASON....2
NOT A REASON.................3

4b. What about this statement: "By the time I could call, the subject would change." Was this a very important reason, a somewhat important reason, or not a reason at all for you?

VERY IMPORTANT REASON........1
SOMEWHAT IMPORTANT REASON....2
NOT A REASON.................3

4c. How about: "I was afraid I would ask a silly question." Was this a very important reason, a somewhat important reason, or not a reason at all for you?

VERY IMPORTANT REASON........1
SOMEWHAT IMPORTANT REASON....2
NOT A REASON.................3

4d. "It felt funny talking to someone who couldn't see me when I could see them." Was this a very important reason, a somewhat important reason, or not a reason at all for you?

VERY IMPORTANT REASON........1
SOMEWHAT IMPORTANT REASON....2
NOT A REASON.................3

4e. "What I wanted to say usually wasn't worth the trouble of getting up, going to the phone, and calling." Was this a very important reason, a somewhat important reason, or not a reason at all for you?

VERY IMPORTANT REASON........1
SOMEWHAT IMPORTANT REASON....2
NOT A REASON.................3

4f. "I felt we should be listening to the workshop leader, not to one another." Was this a very important reason, a somewhat important reason, or not a reason at all for you?

VERY IMPORTANT REASON........1
SOMEWHAT IMPORTANT REASON....2
NOT A REASON.................3

4g. "I didn't feel the workshop leader wanted me to call." Was this a very important reason, a somewhat important reason, or not a reason at all for you?

VERY IMPORTANT REASON........1
SOMEWHAT IMPORTANT REASON....2
NOT A REASON.................3

[*ASK ONLY OF THOSE WHO WATCHED WITH OTHERS*]

4h. "When I had something to say, I would talk to someone watching with me." Was this a very important reason, a somewhat important reason, or not a reason at all for you?

VERY IMPORTANT REASON........1
SOMEWHAT IMPORTANT REASON....2
NOT A REASON.................3

5. Suppose for a moment that you had been given a microphone at the beginning of the workshops for asking questions instead of the telephone. A microphone would work about the same way as it does on the television talk shows. When you wanted to ask a question, you would just speak into your microphone without going to the telephone. [*PROBE FOR COMPREHENSION.*]

5a. Would you have preferred to have a microphone like that, or was the telephone enough?

WOULD HAVE PREFERRED MICROPHONE....1
TELEPHONE WAS ENOUGH...............2

5b. If you had a microphone, do you think you would have spoken up during the program more often, less often, or about the same as you used the telephone?

MORE OFTEN........................1
ALMOST THE SAME...................2
LESS OFTEN........................3

6. When the workshops are given again, at what time of day should they be given? I'll read several different times when they could be given. I'd like you to tell me your first choice <u>and</u> second choice for time of day.

Here are the different times: in the morning, at naptime, in the afternoon, in the evenings and on the weekend. What would be your first choice? Your second choice?

	First Choice	Second Choice
IN THE MORNING.............	1	2
AT NAPTIME.................	1	2
IN THE AFTERNOON...........	1	2
IN THE EVENINGS............	1	2
ON THE WEEKEND.............	1	2

7. When the workshops are offered again, how many days a week should they be offered: 1, 2, 3, 4, or 5 days a week? [*Circle only <u>one</u> response below. If respondent chooses more than one response, ask her to state which is her <u>first</u> choice.*]

ONE.......................1
TWO.......................2
THREE.....................3
FOUR......................4
FIVE......................5

8. The workshops this fall ran for a period of 12 weeks. When they are offered again, should the period be longer, about the same, shorter, or doesn't it matter to you?

LONGER............1
ABOUT THE SAME....2
SHORTER...........3
DOESN'T MATTER....4

9a. When the workshops are given again, would you advise parents and caregivers to watch the programs?

YES...............1 [*GO TO Q. 9b*]
NO................2 [*TERMINATE*]

9b. Who do you feel is the most appropriate audience for the workshops--parents interested in their own children, caregivers taking care of other people's children, or both?

PARENTS...........1 [*TERMINATE*]
CAREGIVERS........2 [*TERMINATE*]
BOTH..............3 [*GO TO Q. 9c*]

9c. Although you think that both parents and caregivers are appropriate audiences for the workshops, do you think that one group--parents or caregivers--is a more appropriate audience than the other? If so, which one?

NO................1
YES, PARENTS......2
YES, CAREGIVERS...3

Table B.1

CATEGORIZATION OF TEST ITEMS IN PARENTING EXPERIMENTS

		Item Contents	Category of Knowledge
I.	CARTOON BOOKLET		
	1.	environmental interaction through rattle	structure/application
	2.	teaching when diapering	structure/application
	3.	infant action schemes	operation
	4.	helping child look for objects	operation/application
	5.	how young children learn to read	application
	6.	characteristic of 18-month-old	structure
	7.	teaching physical knowledge through elaboration	application
	8.	understanding memory limits of young child	structure
	9.	correcting child's speech	application
	10.	using action representation in learning	application
	11.	cooperation not understood by young child	structure
	12.	learning causality in physical world	operation
	13.	requiring inferential comprehension	application
	14.	teaching temporal sequence	application
	15.	classification	operation
	16.	learning through doing	application
	17.	difference between counting and understanding numbers	structure
	18.	teaching information available in pictures	application
	19.	requiring verbalization	application
	20.	teaching how to read	application
II.	SITUATIONS BOOKLET		
	1.	time explanation	structure/application
	2.	classification, age difference in	structure/application
	3a.	reversibility	operation
	3b.	appropriate age	structure
	4a.	seriation	operation
	4b.	appropriate age	structure
	5a.	correspondence	operation
	5b.	appropriate age	structure
	6a.	conservation	operation
	6b.	appropriate age	structure
III.	DEVELOPMENTAL STAGES INSTRUMENT		
	1.	reversibility	operation
	2.	one characteristic at a time	structure
	3.	object permanence	operation
	4.	learning through logic and problem-solving	structure
	5.	method of search for hidden objects	structure
	6.	recognition of personal point of view	structure
	7.	distinction of self and others	structure
	8.	social-dramatic play	structure
	9.	domination by perception	structure
	10.	object constancy	operation
	11.	cooperation	structure
	12.	action dominated	structure
	13.	more than one characteristic at a time	structure
	14.	spatial classifications	operation
	15.	concept of stealing	structure

Table B.2

CORRELATION MATRICES FOR ITEMS ON THREE KNOWLEDGE INDICES[a]

I. Structure

	CB1	CB2	CB6	CB8	CB11	CB17	SB1	SB2	SB3b	SB4b	SB5b	SB6b	DS2	DS4	DS5	DS6	DS7	DS8	DS12	DS13	DS15
CB1[b]	—																				
CB2	.24	—																			
CB6	0	.30	—																		
CB8	.28	0	0	—																	
CB11	.22	0	.41	0	—																
CB17	0	0	0	0	0	—															
SB1	0	.26	.50	0	0	0	—														
SB2	.24	.26	.30	0	0	0	0	—													
SB3b	0	.23	0	0	0	0	.35	.23	—												
SB4b[c]	—	—	—	—	—	—	—	—	—	—											
SB5b	.30	0	.22	0	.37	0	0	0	-.26	—	—										
SB6b	0	.25	.28	.47	0	0	0	0	0	—	.23	—									
DS2	0	0	0	0	0	0	0	0	0	—	.23	0									
DS4	0	.40	.21	0	0	0	.28	.26	0	—	0	.36	0	—							
DS5	0	.29	.39	0	0	.33	.45	.29	.24	—	0	.23	0	0	—						
DS6	-.30	0	0	0	0	0	0	0	0	—	0	0	0	0	0	—					
DS7	.44	0	.32	.50	.22	0	.40	.24	0	—	.30	.34	0	0	.38	-.30	—				
DS8	0	0	0	0	0	0	0	0	0	—	.30	0	.34	0	-.21	0	0	—			
DS12[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
DS13	0	0	0	0	0	0	0	0	0	—	0	0	0	0	0	.42	-.21	0	—	—	
DS15	0	.26	0	0	0	0	0	.38	0	—	0	.37	0	.26	0	.35	0	0	—	.41	—
Total	.38	.54	.57	.45	.30	.22	.56	.53	.34	—	.36	.56	.27	.47	.56	0	.44	0	—	.37	.51

II. Operations

	CB3	CB12	CB15	SB2	SB3[a]	SB4[a]	SB5[a]/6[a]	DS1	DS3	DS10
CB3	—									
CB12	0	—								
CB15	.32	0	—							
SB2	0	.29	.36	—						
SB3a	.21	.28	.54	.30	—					
SB4a[c]	—	—	—	—	—	—				
SB5a/6a	0	0	.32	0	.35	—	—			
DS1	0	0	0	.28	0	—	0	—		
DS3	0	0	.24	.34	.38	—	0	.21	—	
DS10	.48	-.21	.45	.24	.45	—	.21	0	.24	—
Total	.37	.40	.70	.66	.78	—	.41	.41	.56	.51

Table B.2—continued

III. Application

	CB1	CB2	CB5	CB7	CB9	CB10	CB13	CB14	CB18	CB19	CB20	SB1
CB1	—											
CB2	.24	—										
CB5	.37	.27	—									
CB7	0	0	.26	—								
CB9	-.23	0	0	0	—							
CB10	0	0	.36	.48	0	—						
CB13	.22	.26	.29	0	.39	0	—					
CB14	0	.25	0	0	0	0	0	—				
CB18	0	.33	0	0	.29	0	0	.26	—			
CB19	0	0	0	0	0	0	0	.21	.37	—		
CB20	-.22	0	0	0	.45	0	0	0	0	.37	—	
SB1	0	.26	.29	0	.39	0	0	0	.41	.65	.43	—
Total	.21	.53	.55	.29	.48	.38	.54	.35	.51	.61	.48	.63

a

r	p
0	n.s.
.21	.10
.27	.05
.38	.01
.48	.001

[b]CB = Cartoon Booklet; SB = Situations Booklet; DS = Developmental Stages.

[c]Every subject got the item correct; therefore, correlation coefficients could not be computed.

Appendix C
TELEPHONE SURVEY INSTRUMENTS

BASIC TELEPHONE MARKET SURVEY

Family Name ________________________

Address ________________________

Identification No. [ ][ ][ ][ ] Col 1-4

Date: Month/Day [ ] [ ][ ] col 5,6,7

CABLE STATUS: On Cable 1
Fronts Cable 2
Outside Cable Area 3
col 8

Telephone.... 1
Personal 2
Col 9

Call No. [ ] col 10

RA No. [ ][ ] col 11,12

Hello/Good morning. My name is ______________ and I'm doing a survey for the Rand-Spartanburg Project. You may have heard about our work with the local community and public schools. We have selected some Spartanburg families at random to find out what kinds of education and training services people have heard about, and what they are interested in. Would you mind answering a few short questions about your household? Your answers will be kept strictly confidential.

IF RESPONDENT IS RELUCTANT OR ASKS QUESTIONS USE STANDARD ANSWERS AT THIS POINT.

1. How many children under age 18 are in the household? ________________ Col 13,14

   What are their ages, please? ____________________________
   (write age of each child)

   After the interview is completed, record the number of children in each group.

   Under 3 .... ________ Col 15
   3 to 5 .... ________ col 16
   6 to 17 .... ________ col 17

IF THERE ARE NO CHILDREN UNDER SIX, SKIP TO Q. 2 ON PAGE 2.

1a. Does the mother of the child(ren) under six work? ____Yes ____ No col 18

If Yes: How many hours a day? [ ]

1b. Does anyone other than the mother regularly care for the _____ year old for any of the daytime hours? *(Find out who cares for each child under six; start with the oldest child.)* col 19

	Child 1	Child 2	Child 3
a) Mother only	0	0	0
b) A relative (father, aunt) who lives at home	1	1	1
c) A relative <u>comes</u> to the home	2	2	2
d) A non-relative <u>comes</u> to the home	3	3	3
e) He/she <u>goes</u> to a day care center or preschool	4	4	4
f) He/she <u>goes</u> to a relative's home	5	5	5
g) He/she <u>goes</u> to someone else's home (i.e., a non-relative)	6	6	6

(If (f) or (g)): Do you happen to know if they usually keep six or more children at that home?

If more than six	Child 1	Child 2	Child 3
At relatives	7	7	7
At <u>non</u>-relatives	8	8	8
	col 20	col 21	col 22

(Code only 5 <u>or</u> 7; 6 <u>or</u> 8)

2. How many adults 18 years and older are in your household? ..... ________ *record no.* col23

3. How many are over 60 years old? ..... ________ *record no.* col24

IF THERE ARE ***NO ADULTS OVER 60*** *GO TO Q. 4.*

What is that/those person's relation to you? (self; spouse; father; mother; etc.) ________________________

I have a few questions about each person over 60. Let's start with ______ *(name the relation--e.g., yourself, your father, the boarder......)*

		Member #1 col 25-28	Member #2 col 29-32	Member #3 col 33-36
3a.	Are(is) he/she/you employed? *(if Yes)* Is that full-time or part-time?	Unemp...0 Full....1 Part....2	Unemp...0 Full....1 Part....2	Unemp...0 Full....1 Part....2
3b.	Do(es) he/she/you do any volunteer work?	Yes.....1 No 0	Yes.....1 No 0	Yes.....1 No 0
3c.	Did he/she/you complete high school?	Yes.....1 No 0	Yes.....1 No 0	Yes.....1 No 0
3d.	Do(es) he/she/you have any physical difficulties that make it hard for him/her/you to get out of the house?	Yes.....1 No 0	Yes.....1 No 0	Yes.....1 No 0

3e. Is there a TV in the building that you/these older adults can watch during the day? Yes.....1 No 0 col37

3f. *(Interviewer: Check description that best characterizes the household. Probe for further information if necessary and check to see that you have correctly understood the respondent.)*

Say: "As I understand it, your household can be characterized as having:"

(1) One elderly person living alone 1

(2) o An older married couple living together (one or both over 60) or;
 o Older relatives (e.g., sisters) living together (one or both over 60) or;
 o Older individuals (e.g., friends) living together who are not all related 2 col38

(3) Older persons living with younger relatives (e.g., an aunt and her niece) 3

(4) Older persons living with younger persons to whom they are NOT related 4

(5) Other (specify) ________________ 5

4. We are also interested in knowing if your household includes anyone over 18 (and under 60) who has not had a chance to complete high school.

Do you fall into this category?	Yes .... 1 No 0	col 39
If Yes: Are you under 25 years of age?	Yes .... 1 No 0	col 40
Did you complete grade 8?	Yes .... 1 No 2	col 41

5. Are there others in the household between the ages of 18 and 60 who have not finished high school?

Yes 1
No 0
col 42

IF ANSWER IS NO, GO TO Q. 6 ON PAGE 4.

What is that (those) person's relation to you? (spouse, boarder, child, parent, etc.) ______________________________

I'd like to ask you a few questions about ______________________. *(Name relations that did not complete high school.)* Let's start with ______________________.

	Person 1 col 43-45	Person 2 col 46-48	Person 3 col 49-51
5a. *(If necessary)* Is ____________ a male or a female?	Male ....1 Female...2	Male ....1 Female...2	Male ....1 Female...2
5b. Is he/she under 25 or 25 years or older?	Under 25...1 25+ 2	Under 25...1 25+ 2	Under 25...1 25+ 2
5c. Did he/she complete grade 8?	Yes ... 1 No ... 2	Yes ... 1 No ... 2	Yes ... 1 No ... 2
5d. If I have some specific questions for ________, when would be a good time to reach him/her?	____________	____________	____________

.....*continue*.....

6. What is the occupation of the major wage earner in your household? *(Write in and code)*

Professional workers: e.g., physicians, engineers, lawyers, clergymen	 1	col52
Administrative, managerial, supervisory workers: e.g., bank officer, textile mill unit supervisor, store owner	 2	
Technical workers: e.g., nurses, social workers, librarians, teachers, accountants, draughtsmen	 3	
Clerical and sales workers: e.g., bookkeepers, sales clerks, salesmen (all kinds), secretaries	 4	
Craftsmen and production-process workers: e.g., mill workers, toolmakers, machinists, plumbers, welders, carpenters, bakers	 5	
Service workers: e.g., beauticians, policemen, guards, postmen, nurse's aides	 6	
Semi-skilled and unskilled workers: e.g., custodians, launderers, domestic workers, waiters	 7	
Housewife	 8	
Retired	 9	
Unemployed	 0	

7. *IF RESPONDENT HAS NOT COMPLETED HIGH SCHOOL, GO ON TO HIGH SCHOOL COMPLETION SURVEY.*

IF RESPONDENT HAS COMPLETED HIGH SCHOOL, SAY:

That's all the questions I need to ask about your household. But I would like to know if you have heard of the Rand-Spartanburg Cable TV Project before my call. Is this the first time you had heard of our program?

Yes 1 col53
No 0

IF ANSWER IS NO, GO TO Q. 10.

.....*continue*.....

8. As you may know, we have conducted several different public service programs. Can you recall any of the specific programs? *(You may circle more than one) (Probe: Any others?)*

	Not Mentioned	Mentioned	
Can't recall specific projects	0	1	col 54
Day care	0	1	col 55
Adult education	0	1	col 56
Elderly	0	1	col 57
First aid	0	1	col 58
Accounting	0	1	col 59
Tax	0	1	col 60
"City Profile" City information (Womick)	0	1	col 61
"Living," Psychology/Wofford/Seegers	0	1	col 62
"Sports Talk" or other sports programs	0	1	col 63
Medical or health programs	0	1	col 64
Other (specify) ____________________	0	1	col 65

9. And do you recall where you heard of our programs? *(You may circle more than one) (Probe: Was that the only place you heard about it?)*

	Not Mentioned	Mentioned	
Friend/relative/other person	0	1	col 66
Newspaper	0	1	col 67
Radio	0	1	col 68
Television	0	1	col 69
Flier	0	1	col 70
Cable crawl	0	1	col 71
Other (specify) ____________________	0	1	col 72
Don't know or don't remember	0	1	col 73

.....*continue*.....

10. Finally, we would like you to tell us what kinds of programs you would be interested in <u>if</u> we could put them on television. For each of the following programs, could you please tell us whether you would be (1) very interested in watching, (2) somewhat interested, or (3) not interested at all.

10a. How interested would you be in how-to-do-it programs, home repairs, or sewing?

Very interested 1
Somewhat interested 2 col74
Not that interested 3

10b. How interested would you be in a program that helps you understand your car better and how to make minor repairs?

Very interested 1
Somewhat interested 2 col75
Not that interested 3

10c. What about programs on arts and crafts, for example, quilting or furniture making?

Very interested 1
Somewhat interested 2 col76
Not that interested 3

10d. What about sports programs, for example, a program on football plays used in professional football?

Very interested 1
Somewhat interested 2 col77
Not that interested 3

10e. What about courses for college credit?

Very interested 1
Somewhat interested 2 col78
Not that interested 3

10f. What about learning foreign languages?

Very interested 1
Somewhat interested 2 col79
Not that interested 3

10g. What about games you can play at home on your own television set, like those you sometimes see in stores and restaurants?

Very interested 1
Somewhat interested 2 col80
Not that interested 3

END: That's all I need to ask. Thank you for your time and help.

ADULT EDUCATION CANDIDATE SURVEY

Identification No. [ ][ ][ ][ ]

RA No. [ ][ ]

Date: Month/Day [ ] [ ][ ]

Call No. [ ]

Telephone....... 1
Personal........ 2

CABLE STATUS: On Cable............. 1
Fronts Cable......... 2
Outside Cable Area... 3

AGE: Under 25..... 1
25 or over... 2

SEX: Male......... 1
Female....... 2

START HERE IF NEW CALL.

Hello, I'm ________________________ with the Rand-Spartanburg project. We recently spoke with [*name relation, if possible--e.g., your wife, your son, or say "someone in your home"*] about our project, which provides services to the Spartanburg community. As we explained, we are particularly interested in the educational needs of people who have not had a chance to complete high school. Would you mind answering a few questions about your education? Your answers will be kept strictly confidential.

START HERE IF CONTINUATION OF GENERAL SURVEY

1. Did you get all the education you would like to have had?
   Yes 1
   No 0

2. What is the last grade you completed in school?............ [ ][ ]

3. Are you now enrolled in any programs or courses?
   Yes 1
   No 0

IF NO, SKIP PAGE 2 AND GO DIRECTLY TO Q.4 ON PAGE 3.

FOR PEOPLE ENROLLED IN PROGRAMS OR COURSES:

3a. What program or courses are you enrolled in?

- Rand/Spartanburg Tec Adult Ed. *(Go to END, p. 4)*........ 1
- Library GED... 2
- District School's diploma program........................ 3
- Other (specify)________________ *(Go to Q.4, p.3)*........ 4

3b. We would like to know why you decided to complete your high school education. Would you please tell me if any of the following reasons apply to you?

a. Was returning to school encouraged or required by your present employer?
Yes.............. 1
No............... 2

b. Did you think it would help you get a better job?
Yes.............. 1
No............... 2

c. Did you feel you needed to learn the things they teach in high school?
Yes.............. 1
No............... 2

d. Did you finally have the time because you were no longer employed?
Yes.............. 1
No............... 2

e. Did you finally have the time because your children were older?
Yes.............. 1
No............... 2

f. Did you just feel ready to go back to school?
Yes.............. 1
No............... 2

g. Did your family want you to finish school?
Yes.............. 1
No............... 2

h. Were you influenced to go back to school because all your friends had finished school?
Yes.............. 1
No............... 2

i. Did you think you would enjoy going back to school?
Yes.............. 1
No............... 2

j. Did you want to get out of the house and meet other people?
Yes.............. 1
No............... 2

k. Did you go back because there was money available from the government to go back?
Yes.............. 1
No............... 2

4. Do you plan to go back to school in the next two or three years?

Yes................. 1
No.................. 2

5. Are the chances pretty good that you'll finish high school at some time?

Yes................. 1
No.................. 2

6. I'm going to read some statements that describe how some people feel about returning to finish their high school education. Would you please tell me if, in your case, you agree or disagree with each statement.

a. Getting your high school degree would open new opportunities for you.

Agree............... 1
Disagree............ 2

b. The work in high school programs would be pretty hard.

Agree............... 1
Disagree............ 2

c. What you'd learn in a high school program would be useful in your day-to-day life.

Agree............... 1
Disagree............ 2

d. You'd be more likely to complete high school if you could take the necessary classes at home over television.

Agree............... 1
Disagree............ 2

e. One reason for going back to school is to get out and meet people.

Agree............... 1
Disagree............ 2

f. You don't learn much when you take classes over TV.

Agree............... 1
Disagree............ 2

g. Deep down inside, you're not sure finishing high school matters that much.

Agree............... 1
Disagree............ 2

7. That's all the questions. I need to ask about you. But I would like to know if you had heard of the Rand-Spartanburg cable TV project before my call.

Yes................. 1
No.................. 0

IF NO, GO TO 9.

8. As you may know, we have conducted several different public service programs. Can you recall any of the specific programs? *(You may circle more than one.) (Probe: Any others?)*

	Not Mentioned	Mentioned
Can't recall specific projects	0	1
Day care	0	1
Adult education	0	1
Elderly	0	1
First aid	0	1
Accounting	0	1
Tax	0	1
"City Profile" City information (Womick)	0	1
"Living," Psychology/Wofford/Seegers	0	1
"Sports Talk" or other sports programs	0	1
Medical or health programs	0	1
Other (specify)________________________	0	1

IF ADULT EDUCATION NOT MENTIONED:

9. Have you heard anything about an adult education cable TV program?

Mentioned above........ 0
Yes.................... 1
No..................... 2

What have you heard about the adult education programs on cable? Could you describe anything about it?

		Not Mentioned	Mentioned
a.	"Just on television"	0	1
b.	"Cable television," "on cable"	0	1
c.	"Two-way"	0	1
d.	"Two-way" with description	0	1
e.	"Spartanburg Tec"	0	1
f.	"GED," "Take S.C. test"	0	1
g.	"Finish high school"	0	1
h.	"Pre-GED," "Get ready for GED"	0	1

If no evaluation offered, probe: Have you heard anything about how worthwhile the program is?

i. Good program 3
OK 2
Weak, poor 1
No evaluation 0

10. Do you recall where you heard about our programs? *(You may circle more than one.) (Probe: Any others?)*

	Not Mentioned	Mentioned
Friend/relative/other person	0	1
Newspaper	0	1
Radio	0	1
Television	0	1
Flier	0	1
Cable crawl	0	1
Other (specify)____________	0	1
Don't know or don't remember	0	1

11. Suppose you had a chance to watch a program on television that would help you finish high school at home. Would you be:

Very interested........... 1
Somewhat interested....... 2
Not very interested....... 3

12. Finally, could you please tell us what year you were born?

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END: That's all I need to ask. Thank you for your time and help.

Remember: If the Adult Education Survey is a continuation of the Basic Telephone Market Survey, transfer the answers to Q.8 and Q.10 to the respondent's BASIC TELEPHONE MARKET SURVEY.