



July 7, 2000

MEMORANDUM FOR The Federal Co-Chairman
 ARC Executive Director
 ARC General Counsel


SUBJECT: OIG Report 00-30(H)—Learning Logic Educational Program,
 University of South Alabama (AL-12661-97)

Enclosed is a copy of the final report dealing with the subject grant. Open issues pertain to the lack of support for some claims and the eligibility of tasks not specified in contracts. The conditions noted reflected the need for increased grantee oversight of project activities.

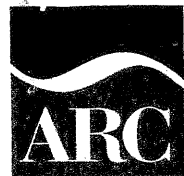
We have also provided ARC managers with additional correspondence submitted by the Project Director and consultant subsequent to the issuance of our draft report, and this information could facilitate determinations with respect to the eligibility of approximately \$26,000 in claims that we question.

On an overall basis, the primary objective of establishing a learning facility at Northeast Alabama Community College was achieved; but objectives related to facilitating the expansion of the learning program to other groups or locations were not achieved.

We will followup with ARC program staff with respect to resolution of the open issues.


Hubert N. Sparks
Inspector General

Enclosure



JUNE 23, 2000

OIG REPORT 00-30(H)

MEMORANDUM FOR DEAN CARL C. MOORE COLLEGE OF BUSINESS AND MANAGEMENT STUDIES UNIVERSITY OF SOUTH ALABAMA

SUBJECT: Memorandum Survey Report--Learning Logic Educational Program Project, AL-12661-97

Purpose

The purposes of our review were (1) to determine the allowability of the costs claimed under the ARC grant, (2) to determine if the grant objectives were met and (3) to determine the current status of the project.

Scope

Our survey included procedures to review costs incurred and claimed for reimbursement under the grant, as well as costs claimed as matching funds. The period of performance for the grant was May 1, 1997, through January 31, 1999. We reviewed the grantee's reports, examined records, and held discussions with grantee officials in Mobile and Rainsville, Alabama, on February 18 and February 23, 2000, respectively. As a basis for determining allowable costs and compliance requirements, we used the provisions of the grant agreement, Office of Management and Budget (OMB), Circulars A-21 and A-110, and the ARC Code. Audit work was performed in accordance with Government Auditing Standards.

Background

ARC Grant AL-12661-97 was originally awarded to the Project Director at the Small Business Development Consortium, which is affiliated with the University of Birmingham. The Project Director left the University of Birmingham and was hired by the University of South Alabama (USA) in December 1996. USA allowed the Project Director to finish the grant and USA administered the accounting aspect of the grant only. The Project Director left USA January 8, 1999; and further project activity was terminated by the grantee.

The purpose of the grant was to provide funds to establish a training facility for advanced mathematics training at Northeast Alabama Community College (NACC) using proven technology that has previously been demonstrated within Alabama and other locations called Learning Logic (LL) software. Outreach projects were to include math camps, demonstrations to high school teachers and students, upgrading the skills of the area's workforce and implementation of the LL program through out the Appalachian region.

Records indicated the LL math software was created in 1989 and, according to the vendor, was continuously updated and has been installed in over 74 learning institutions, with over 11,000 students having used the program as of 1997. The software included pre and post testing of each student as they take courses.

The grant was for \$160,000 (80 percent) of actual, reasonable, and eligible costs of the project. The grantee was to pay or cause to be paid the non-ARC share of \$40,000 (20 percent) in cash, contributed services, or in-kind contributions.

Regulations require that records be maintained for 3 years after project closing.

Results

Financial Review

The grantee claimed total project costs of \$169,509, which included grant costs of \$132,373 (78 percent) and non-federal matching costs of \$37,135 (22 percent). ARC payment records showed a deobligation of \$27,626 in funds and close-out September 30, 1999.

Of the \$132,373 ARC grant approximately 50 percent was used for computer equipment and software and about 50 percent was applicable to the Project Director's and consultant's salaries and related expenses.

Project expenditures were noted as follows:

	<u>Federal Funds</u>	<u>Match</u>
Computer Equipment—Hard and Software	\$ 63,714	\$ 0
Project Director—Salaries and Fringe Benefits	46,384	6,125
Project Director—Travel	4,861	0
Consultant	10,843	5,350
NACC (Installation Costs and Travel)	5,811	25,660
Other	<u>760</u>	<u>0</u>
Total	<u>\$132,373</u>	<u>\$ 37,135</u>

During our visit, we reviewed the grantee's accounting records, including invoices and supporting documentation for a sample of grant and matching costs charged to the project. Although claimed costs were supported by the grantee's accounting records with respect to identification of total costs claimed, we are questioning the support for some claims due to the absence of documentation identifying the dates or level of services or the eligibility of the activity in relation to tasks outlined in contracts.

Project Director—Claims for salary reimbursement by the Project Director for the period October 1998 through January 1999 totaled \$16,591. A progress report covering the period November through December 1998 was not located despite the availability of an unsigned copy of a transmittal letter. Also, the final project report,

dated September 21, 1999, did not identify significant activity during this period; and the progress report for the period June through October 1998 did not identify significant activity in October 1998. The computer lab at NACC was operational as of November 1997; and reports submitted to ARC, while noting some additional supportive activities in connection with post-testing of students and attendance at meetings in early 1998, did not identify a level of activity supportive of final claims for reimbursement.

For example, available quarterly project progress reports emphasized establishment of the learning facility at NACC, acquisition and operation of equipment, extent of classes and student participation, summer program, assessment survey, and pre- and post-tests. The bulk of these activities, with the exception of the consultant's involvement in assessments, appeared to have been conducted by NACC staff and incorporated in overall progress reports. The progress reports contained some identification of outreach efforts and individual contacts.

The final report, submitted September 16, 1999, essentially summarized the progress reports. This report contained little information with respect to project activity in the latter part of 1998 other than NACC classes, student participation, and the consultant's assessment.

Subsequent to issuance of our draft report, the Project Director provided additional information about activities and tasks throughout the grant period. She also noted she had suffered a serious leg injury in October 1998, which limited field activities until her resignation in January 1999. She noted project work was conducted from her home or office. The information submitted by the Project Director cited numerous outreach contacts with local governments, educational institutions, and businesses during the course of the grant, including October 1998, until grant termination on January 9, 1999. The only specific contacts noted subsequent to October 1998 were discussions with ARC staff and discussions with project participants about additional equipment for NACC.

The Project Director noted that records pertaining to specific contacts had been disposed of after submission of the final report; and, thus, she was unable to identify dates of contacts.

Although we do not question the information with respect to outreach efforts and contacts, the absence of supporting evidence does not permit confirmation of the level of effort reported. Since regulations require retention of records for 3 years after grant closing, we have identified the final claim as unsupported pending ARC determinations as to the eligibility of costs claimed.

Also, the Project Director's response to the draft report identified numerous contacts with companies in order to develop funding support for CD-ROM and internet connections for the LL concept. Although outreach and extension of the program by demonstrating the value of the program as an educational tool were project objectives, it is questionable as to whether solicitation of funding was an eligible task; and the eligibility of related costs is also subject to decisions by ARC.

With respect to training provided by the National Science Center Foundation (NSCF) in August, Georgia, the final report noted formal training for six faculty from NACC during the week of August 3-8, 1997, and states that the consultant and Project Director (identified as the principal investigator) attended the LL training session during the week of August 20-23. Although no formal training was conducted during this period, discussions were held with NSCF staff about the LL program.

Consultant—The consultant's contract, which was for \$20,000 in direct fees and \$10,000 in consultant contributions, included the following tasks:

1. Provide support in the coordination of Learning Logic Program;
2. Develop and implement two workshops for high school principals and teachers and community college instructors to demonstrate the system;
3. Spearhead the development of a strategic plan for follow-on progress to deploy the program across the region;
4. Attend the Learning Logic Training session in Augusta, GA;
5. Provide written quarterly and final reports;
6. Provide in-kind services

The consultant claimed \$10,843 in direct costs and noted contributions of \$5,350 as matching costs. Our question with respect to the costs claimed relates to tasks performed in relation to the above contract tasks.

Records indicated that the primary consultant activity related to development of a survey tool and surveys of students utilizing the LL program. Although the activity may have been considered as part of the research and supportive activities noted in the consultant scope of work, student surveys/tests were not specifically identified as a task; and it did not appear this task was intended to be the primary consultant activity, comprising over 80 percent of his time. However, 263 of the 319 hours charged to the project at \$50 per hour were identified as developing a survey of students using LL, survey reliability testing, data input and analysis of the surveys. There was no indication that a strategic plan or other activities necessary to deploy the program across the region had been completed.

Progress reports submitted to ARC during the project noted the development of assessment tools, pre- and post-testing of students, and survey analysis. Thus, ARC had some information pertaining to the consultant's primary activity.

The consultant's response to the draft report stated that "the primary concern of the sponsor and the consultant was to assess the effectiveness of LL as the most effective computer-based training system for teaching algebra. Since this was the first LL system installed in a junior college, the program's effectiveness needed to be reviewed before

widespread deployment could be considered. Thus, much of the consultant's time and effort was spent developing assessment tools and carrying out related research."

We also noted that an ARC project coordinator had raised a question in December 1998 about the payment of a consultant for measurable outcomes. Progress reports submitted to ARC had identified survey instrument development and measurement through pre- and post-testing of students as being spearheaded by the consultant. These factors, along with reasons provided for conducting the pre- and post-testing and absence of a strategic plan, should be considered when determining the eligibility of claimed costs with respect to the scope of work and completion of tasks related to outreach and expansion of the program.

We do not disagree with the need for measurement and testing in order to assess project results and future utilization. However, our concerns relate to project justifications that emphasize the LL program as a proven technology, correspondence that notes the LL program laboratory is not meant to be a test facility, and the lack of assessment and testing as a major activity in the grant agreement or consultant's contract.

Thus, we are questioning reimbursements to the consultant pending ARC's determination about the eligibility of these costs.

Program Review and Outcomes

A site visit was made to the Northeast Alabama Community College (NACC) in Rainsville, Alabama. The computer lab appeared complete and equipment was in place and being utilized. The 30 computers, with the Learning Logic software pre-installed, and related equipment was received at the college. NACC completed and paid for all related installation and classroom equipment purchases, NACC was reimbursed for \$2,939 towards the installation and contributed \$25,660 in matching costs.

Training for the teachers was conducted at the National Science Center Foundation (NSCF) facility in Augusta, Georgia. NACC stated that the vendor National Science Center Foundation (NSCF) has provided excellent technical assistance. A class was observed at NACC with students of various math levels using the computers at their own pace. The college has had very positive results with the software and had made the Learning Logic computer courses part of their permanent curriculum. NACC purchased six additional computers on their own to help accommodate the additional students wanting to take the courses. NACC stated they would like to expand their computer courses.

NACC had conducted two summer math camps; workshops and demonstrations for area high school teachers, students, and principals; presentation of the LL program at their annual math competitions; and outreach to private industry. NACC had full responsibility for carrying out the outreach programs and absorbed all costs, as stated in their contract with USA.

Available information indicated that intended Project Director and consultant activities with respect to curriculum development, outreach to area schools and to private industry and strategy plans for follow-on programs across Alabama were apparently not

performed and/or successful. Quarterly and final reports highlighted the extent of student participation; some overall results; and identification of some additional supportive actions, including meetings and contacts. These reports extensively summarized information provided by NACC. Discussions at NACC indicated that contacts with the Project Director were limited after equipment was installed in November 1997 and that outreach efforts noted in project reports were primarily conducted by NACC.

Also, discussions at NACC indicated that survey results, which included questionnaires to about 900 students (these were administered by the teachers, but NACC was informed by the consultant that they were not properly filled out and could not be used) and some pre- and post-survey work by a graduate student with 30 additional NACC students, were not all shared with NACC. As noted earlier, the LL program included software for the pre- and post-score testing of students.

We noted some survey analysis in a progress report dated October 9, 1998. The grant extension from August 31, 1998, to January 31, 1999, had been approved to accommodate survey analysis; and the final report provided details with respect to survey results.

Discussions with NACC staff and review of correspondence indicated overall satisfaction with the program as an effective educational tool; and progress and final reports identified improved Algebra skills, decreased anxiety about math, improved average scores for algebra, and changed student learning strategies. Some staff at NACC were particularly enthusiastic about the benefits of the LL program, citing it as enhancing the delivery of mathematics to students and permitting increased instructional efficiency and instructional cost savings. Also, one NACC official noted a commitment to the program and an intention to continue the program after the grant period.

Reports transmitted to ARC during the project period were generally consistent with positions noted by NACC staff. However, these reports, while identifying the positive results, also included some reservations about the program, with a primary constraint noted as the absence of a control group using traditional instruction methods against which an LL group could be measured.

These reservations were subsequently reiterated in correspondence from the consultant, wherein it was also noted that it was difficult to recommend LL for widespread use because, for example, the LL program did not reveal a clear-cut advantage over traditional teaching methods.


On the issue of a strategic plan for follow-on programs, the Project Director's response to our draft report notes that, after visiting NSCF in mid-1997, it was determined no empirical research on the effectiveness of the LL program had been conducted. Based on this knowledge, the limited analysis subsequently derived from the student population at NACC, and the results of assessments, a strategy to deploy the LL program across the region was considered to be premature.

The final report and progress reports, despite noting reservations about test methodologies and results, did not reflect reservations about deployment of the program or development of a strategic plan.

In conclusion, we recognize that primary project objectives to establish a learning facility at NACC were accomplished but believe other objectives directed at expanding program use throughout the region were not achieved.

Recommendations

1. ARC, in coordination with the grantee, should determine if the work performed and project results were sufficient to justify the claims submitted.
2. For future grants, the grantee and ARC should ensure that oversight of project staff, including consultants, is sufficient to ensure implementation of agreements, performance in line with project scope and identified tasks, and retention of records necessary to verify performance.


Hubert N. Sparks
Inspector General

Grantee's and Auditor's Response

Information provided by the Project Director and consultant in response to the draft report identified actions taken and some of the problems or constraints restricting accomplishment of some objectives. The Project Director stated she suffered a serious injury in October 1998 and essentially worked at home for the remainder of the project period

The Project Director provided information, including listings of numerous contacts made during the grant period, about grant-related activity. However, the information did not identify the dates of the contacts, level of efforts, or results; and, thus, it was not possible to verify the applicable time frame or confirm the efforts that took place from October 1998 to January 1999. This occurred, according to the Project Director in her response, because project-related records had been disposed of by the Project Director after the project was closed and leaving USA in January 1999.

The Project Director's response also noted numerous contacts with companies in an endeavor to develop funding support for the CD-ROM and internet applications for the LL concept.

Auditor's Response: The absence of specific information about activities subsequent to this date results in identification of the \$16,591 as unsupported, with final determination of eligibility resting with ARC program management. The grant agreement states that records must be maintained for three years after completion of grant. Also, contacting companies in an effort to develop funding support for CD and internet applications for LL did not appear to be a grant task and time spent on this endeavor may not be chargeable to this grant; and a final determination of eligibility on this issue rests with ARC program management.

The consultant's correspondence with respect to the time spent on pre- and post-testing noted that "the primary concern of the sponsor and the consultant was to assess the effectiveness of LL as the most effective computer-based training system for teaching algebra. Since this was the first LL system installed in a junior college, the program's effectiveness needed to be reviewed before widespread deployment could be considered. Thus, much of the consultant's time and effort was spent developing assessment tools and carrying out related research." The consultant also provided information about the assessment tool developed to test the effectiveness and results of the LL program.

Auditor's Response: Neither the grant's scope of work nor the consultant's contract identifies the assessment of the effectiveness of the LL program as a specific task. Information indicates LL was a proven technology as stated in the proposal, and assessment tools appeared to have been previously developed. We do not disagree with the need for testing and assessments; but our concerns, as previously noted, relate to the project being submitted based on proven technology and the absence of identifying testing and assessment as a primary task in the application or contracts. In a letter to ARC requesting approval of

the grant, dated June 2, 1997, the Project Director states "The Learning Logic Program laboratory is not meant to be a test facility."

The Project Director and the consultant stated that the "assessment of the LL program did not reveal a clear-cut advantage of LL over traditional teaching methods. There was no significant improvement in performance of students using LL. This made it difficult for the contractors to recommend this for widespread use of the system."

Auditor's Response: In the consultant's progress reports dated February 23, 1998, and October 9, 1998, the consultant stated "All students have significantly improved their Algebra skills as a result of taking this (LL) courses. Student's anxiety for math decreased after using LL. In all classes, the students have made significant improvement in achieving the national goals for algebra. The average scores improved from 47 to 73 between the pre- and post-tests. There was a significant change in the learning strategy of students after using learning logic."

The Project Director's and the consultant's rationale for not developing a strategic plan for widespread use, as stated in his contract, does not agree with their progress reports, the Project Director's reports, or with the grant proposal.

Overall Project Results

The NACC staff, Project Director, and consultant initially noted overall satisfaction with the program as indicated by correspondence and reports in February and October 1998 indicating students significantly improved their Algebra skills as a result of taking LL courses. The consultant's analysis provided to ARC noted that students' anxiety for math decreased after using LL, in all classes the students made significant improvement in achieving the national goals for algebra with average scores improving from 47 to 73 between pre- and post-tests, and there was a significant change in the learning strategy of students after using LL.

Recommendations

1. ARC, in coordination with the grantee, should determine if the work performed and project results were sufficient to justify the claims submitted.
2. For future grants, the grantee and ARC should ensure that oversight of project directors and subcontractors is sufficient to ensure implementation of agreements and retention of records necessary to verify performance.

Hubert N. Sparks



December 12, 2000


MEMORANDUM FOR MS. JUDY RAE, DIRECTOR, PROGRAM OPERATIONS

SUBJECT: Grantee Response with Respect to Grant AL-12661-97, Learning Logic Educational Program Project

We have reviewed the response and believe that the grantee, not ARC had responsibilities for providing institutional control, including monitoring the project and ensuring the availability and retention of appropriate records. However, in view of the overall circumstances, we have no additional recommendations about this case and will have no objections to ARC decisions on our recommendations.

On an overall basis, we believe, as previously discussed, it is appropriate to notify grantees about unresolved issues and obtain grantee explanations and/or justifications prior to closing reports. Also, such notification better alerts grantees to their responsibilities when administering future grants, be it from ARC or other agencies.

On a program basis, we also believe it is important to alert grantees who intend to use consultants or other contract services that primary responsibilities for ensuring compliance with applicable procedures and grant agreement provisions rest with the grantee. We have recently noted several similar-type cases where consultants' activities could be questioned with respect to work performed; and although we did not vigorously pursue these cases, they reflect an area that should be emphasized when reviewing and approving project applications (see attached letter).


Hubert N. Sparks
Inspector General

Attachment

UNIVERSITY OF SOUTH ALABAMA



MITCHELL COLLEGE OF BUSINESS
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DEC 11 2000

December 6, 2000

Mr. David Hughes
Program Analyst
Program Operations Division
Appalachian Regional Commission
1666 Connecticut Avenue, NW, Suite 700
Washington, DC 20009-1068

re: ARC Grant AL-12661-97
Learning Logic Educational
Program Project

Dear Mr. Hughes:

Thank you for your letter of November 28, 2000, outlining the unresolved issues regarding ARC Grant AL-12661-97. As you are aware this was a unique and difficult grant to manage due to the circumstances associate with the grant. The University of South Alabama agreed to the transfer of the grant from The University of Alabama Birmingham upon the hiring of Susan Armour as Director of the Small Business Development Center of the Mitchell College of Business. Ms. Armour was terminated as SBDC Director before the completion of the grant and was provided staff support and office space for a period of one year to complete the grant. The final report for the grant had not been prepared and submitted to ARC when Ms. Armour resigned in January of 1999.

I respectfully request that ARC waive any University of South Alabama obligation for unresolved costs based on the following:

1. USA provided office space, computer access, and staff assistance for one year at no cost to the ARC grant.
2. USA did not receive any indirect cost support for the administration of the grant. The allowable indirect costs under the federal negotiated rate would have been $\$160,000 \times 26\% = \$41,6000$.
3. USA received no indication from ARC that the work was incomplete or that some work exceeded the scope of the contract prior to Ms. Armour's resignation.
4. After Ms. Armour resigned, she filed a lawsuit against USA and during this period if was extremely difficult to communicate with Ms. Armour.

The University of South Alabama expended a significant amount of time and resources to administer this grant in the appropriate manner. While we deeply regret the problems that occurred, it is important to note that USA did not receive information that would have allowed some institutional control of these matters prior to the announced completion date for the grant or prior Ms. Armor's resignation from USA.

We appreciate your consideration of this request

Sincerely,

A handwritten signature in black ink, appearing to read 'Carl C. Moore', written in a cursive style.

Carl C. Moore
Dean

cc. Mr. Robert Galbraith
Office of Sponsored Programs

4.0 ARC PROJECT PROPOSAL

The University of South Alabama Small Business Development Center, College of Business and Management Studies; William R. Boulton & Associates; and Northeast Alabama State Community College propose to establish a training facility for advanced mathematics training at NASCC using proven technology that has previously been demonstrated within Alabama and to further the goals of ARC in upgrading the skills of the workforce, students and teachers within the Appalachian Region. By providing a demonstration and training center, this program will establish the centerpiece of an infrastructure for wide-spread distribution of this technology throughout the region. With the State's commitment to upgrade computer technology in its schools, this program will provide an alternative approach for making a wide-spread investment in the future of the region.

Most important, by implementing an established program for upgrading the basic mathematical skill level of students and workers within the Appalachian Region, this program will provide a marketing mechanism for attracting new high value added business into the region. It will provide a facility in which government, academic, and business leaders can observe a proven methodology for training math skills using advanced learning-based technologies. The proposed infrastructure takes advantage of advanced client/server technologies to deliver individualized math education.

5.0 LEARNING LOGIC PROGRAM OBJECTIVES

The Learning Logic Program Objectives are in concert with the Appalachian Regional Commission's Objectives as well as Alabama's State Objectives to enhance the skills and knowledge of Appalachian residents through school-to-work educational training programs. The Learning Logic Program Objectives include:

1. **SKILLS AND KNOWLEDGE:** Math skills and science knowledge are two areas of education that the Appalachian Region has identified as required for economic success in the 21st century. The objective of this proposal is to target math education in the Appalachian Region.
2. **PHYSICAL INFRASTRUCTURE:** The objective of this proposal is to establish the physical infrastructure required to train students, teachers and workers in math. By setting up a regional demonstration center, "train the trainer" programs can be established. The demonstration center can also be used for

"continuing education" for companies in the area that have a need for employees to have advanced mathematical skills or retraining needs.

3. COMMUNITY CAPACITY: The proposal includes the purchase of one client/server system with 30 student-training terminals for one classroom setting. The classroom can be utilized throughout the week for day and evening sessions. A complete system of hardware and software is required to effectively deliver the program. Once the basic system is in place, additional terminals can be added at a cost of approximately \$1100 per seat.

4. DYNAMIC LOCAL ECONOMIES: The facility will provide a learning center laboratory for advancing the basic mathematics skills in the Appalachian Region. In addition to demonstrating the application of technology for improving mathematical skills, it can also be the basis for spreading the technology throughout the region and for attracting new industry into the area.

6.0 PROJECT DESCRIPTION

The program is applicable for individuals whose capabilities excel in the studies and career orientation of mathematics, science, engineering and additional technical fields of interest. The self-paced seamless curriculum enables students to transfer mathematical applications to quantitative thinking. Most importantly, The Learning Logic (L^2) program is especially relevant for those individuals who will be entering the work force directly from high school or for individuals who are in need of retraining or advanced skills training. These mathematical and computer skills are essential for preparation of obtaining a job in today's technology oriented organizations, and are essential for the Alabama Appalachian Region's capability to compete in the rapidly changing technological world.

① The establishment of the laboratory training center will provide the equipment (infrastructure) required to support the computerized educational programs. In addition, the program will provide technical support in the establishment of user groups. Throughout the ARC, the pilot program will provide the support to develop a "Train the Teacher" curriculum. ② provide student learning laboratories; ④ establish computerized student classes for local community colleges; and ⑤ provide adult training for the local communities.

The Learning Logic (L^2) program features include user-friendly interactive tutorials, randomly generated and graded homework assignments and testing capabilities, a glossary, a graphing calculator, a curve-fitting tool, a scientific calculator, and an

interface to a mathematical symbolic language manipulator. Current uses of the Pre-algebra, Algebra I and II curriculums are applied in educational programs for technical college developmental studies, honors classes, talented and gifted programs, and general studies in middle schools, high schools, military schools and technical colleges. To date, approximately 11,000 students in 70 schools throughout the United States and abroad participate in the fully integrated Learning Logic (L²) program.

Learning Logic (L²) does not attempt to replace the teacher; however, the program allows students to learn at their best capability rate, freeing the teacher to tutor students individually. Students who excel are not held back and slower students or students who missed classes are not behind in lesson plans. The structure of the program requires direct interaction and continual responses from users. Depending upon testing and placement of a student, the program allows a student to bypass mastered material to the next level of challenge. The program easily facilitates transfer students from a traditional class or school program.

The interactive, computerized mathematics program lends itself to student self-discovery and teacher-directed activities. The curriculum is tailored to the individual student with immediate feedback on all applications. Learning Logic (L²) is updated throughout the school year and changes are initiated upon recommendations by teachers and students. Communication is directed with the program developers via electronic mail which is built into the program.

The National Science Center Foundation reports in its Executive Summary publication, that in 1990-91, Learning Logic (L²) was initially tested in seven Georgia high schools. Teachers identified that students took more responsibility for learning, taking more time on task; improvement in students' reading skills were noticeable; and disciplinary problems decreased. Comparison of the traditionally taught Algebra I classes with the first year the Learning Logic used at one school recognized that Algebra I enrollment grew 50 percent, yet school enrollment was unchanged; the total failure rate decreased 43 percent; the total failure rate for students taking an introduction Algebra course decreased from 35 percent to 11.7 percent; and student enrollment in the math course immediately following Algebra I increased 67 percent. In Carrollton, Georgia High School, the failure rate dropped from 42 percent to five percent.

The NSCF reports that in selected Alabama schools where Learning Logic (L²) applications are or have been used, teachers have recognized decreased failure rates, improved student attitudes, better study habits, and declining discipline problems. A Prattville, Alabama High School teacher states that "the 80 percent minimal level mastery for

advancing to another concept has had an affect on increased long-term retention, boosted student's self-esteem, and initiated friendly competition among students in the classroom." The Prattville community has demonstrated its support by sponsoring fund-raising efforts to assist in the purchase of computer equipment for the laboratory.

In Montgomery, Alabama, a Jefferson Davis High School teacher who utilized the program for remedial application noted that the requirement of 80 percent mastery before continuing to the next concept slows the process, but recognized that to encourage students to master algebra over one and a half to two years would be far more advantageous than to continue to have student semester failure rates and discontinuance of algebra studies.

In utilizing the Learning Logic (L^2) program for the first six week term during the 1996-1997 school year at Wetumpka High School, the teacher stated, "she had no failure rates." One student who experienced an average grade of 38 in the traditional mathematics environment stated, "he excelled to an average of 87 in the first term using the program." The self-taught, self-paced computerized methodology enables the Wetumpka High School teacher to give individualized attention to students at all capability levels. This teacher promotes and respects the demonstrated flexibility, latitudes, and positive results of the instructional capabilities of the program as compared to the traditional approach of teaching mathematics. The Wetumpka High School teacher reported that on their own volition, many of her students return to the classroom after their initial classroom period to continue their challenges in mathematics through the computer-based program.

The Learning Logic (L^2) program has been introduced in the Prattville, Wetumpka, Piedmont, Smiths Station, Jefferson Davis, Theodore, and Davidson High Schools in Alabama. However, due to lack of funding support, Jefferson Davis, Theodore, and Davidson High Schools could not continue the program beyond the one to two year trial basis.

7.0 NEEDS ASSESSMENT

National and international testing has consistently identified low achievement and failure rates in the mathematics and sciences arenas. The NSCF reports disturbing statistics that only six percent of U. S. high school seniors are competent in basic algebra skills; 37 percent of college freshmen must take remedial math; only 16 percent of fourth-grade students can apply math problem-solving skills with a decrease to 9 percent when they have graduated to the 12th grade level; and 35 percent of secondary students elect not to take math courses beyond Algebra I. Additionally, approximately 60,000

uncertified math and science teachers provide instruction in U.S. high schools; 80 percent of teachers of grades one through eight are inadequately trained to teach mathematics.

Industry is not without its problems of educational failure in attempting to hire workers for skilled jobs and in providing retraining or upgrade training for new technological advancements in industry. The NSFS reports that approximately \$25 billion a year is spent by U.S. companies on remedial training of the work force; by 2006, a shortfall of 675,000 scientists and engineers will occur in the U.S.; and 7.5 percent of the gross national product (GNP) is spent on education in the United States.

8.0 PROBLEM

Alabama's educational level continues to decline at exceptional rates due to the basic skills capabilities in elementary, middle and high schools, community colleges, colleges and universities and in the work force. Adults and students find difficulty in obtaining work in the job market because of the lack of basic skills in reading, writing, and mathematics. Industry suffers because the labor force is void of qualified skilled workers who have the basic skill knowledge to perform lower to higher level jobs. The problem is how to reverse these trends and how to provide the needed technical education and training to enable Alabama's Appalachian region to compete in today's technological business climate.

9.0 OPPORTUNITIES AND ANTICIPATED RESULTS

The anticipated direct results of the program are the development of an infrastructure for enhancement of student learning interest and proficiency in math and science through modern technology; a significant decrease in mathematical failure rates; accomplishment of at least an 80 percent mastery level; and proficiency of computer technology for both students and teachers.

Significant anticipated benefits of the program are the resulting decrease in school dropout rates; the enhancement of the "industrial arts" curriculums in the technical and community colleges to promote the school-to-work transition programs and initiate innovative program development to meet the demands of technology based skill levels and productivity; and perpetuate the enrollment in secondary and post-secondary education. In collaboration with the National Science Center Foundation, curriculum can be developed by teachers for any subject matter that would be conducive to computerized learning skills.

The program provides the first step toward the development of a coordinated computerized math and science integrated learning infrastructure model for educational institutions to employ throughout the 35 Alabama Appalachian counties which could be expanded to the 13 state Appalachian Region.

The proposed project provides the opportunity to combine the resources of the USA-SBDC, College of Business and Management Studies; William R. Boulton & Associates; Northeast Alabama State Community College; and the National Science Center Foundation in a cooperative effort to achieve the following endeavors:

- Enhancement of student learning capabilities for accomplishment and completion of curriculum objectives, including GED requirements.
- Accomplishment of learned basic math and computer skills for secondary, post secondary and adult students will enhance their capability to gain employment in a business, service or manufacturing environment.
- The mastery of the educational program will assist the student in achieving advancement in a higher skilled job market.
- Enable organizations to recruit and hire employees who are knowledgeable of the basic learning skills and can perform the job for which the person was hired.
- Promote economic development by providing a high skilled work force that will attract and sustain businesses and manufacturers with high technology jobs in the Appalachian communities of Alabama.
- Provide the basic self-learning educational program that will serve as a premier recruitment vehicle for the community colleges and for industry.
- Provide a program that will enable students to receive educational credit and provide joint enrollments.
- A mathematics and computer building block process that will gain industry support through funding for the program, cooperative educational and training programs, and potential employment for students.
- Provide a program that will enhance training capabilities for teachers. The program enables teachers to perform as program administrators, monitor students at varying capability levels, and serve as mentors for individual successes. The program allows for

the development of a seamless curriculum whereby teachers may choose modules based on individual student needs, depending on placement tests and individual assessments. The curriculum for industry-based modules can be developed specifically for individual company training and skill level needs.

- Develop a strategic plan for a dedicated infrastructure of a computerized educational program concept.

10.0 BENCHMARKS AND PERFORMANCE MEASURES

The following provides a detailed description of performance measures, program efficiencies and anticipated benefits to be derived from the Learning Logic Program. Implementation of the program will support the goal of providing educational training programs to enhance student and workforce capabilities necessary to compete in a global economy.

1. Northeast Alabama State Community Colleges proposes to facilitate the Learning Logic methodology to include: four (4) classroom sections during daytime hours, enrolling 120 students on a four-day schedule per quarter; four (4) classroom sections during evening hours, enrolling 120 students on a four-day schedule per quarter; and an enrollment of approximately 120 industry and workforce participants for specialized training for a total enrollment of a minimum of 1100 students over a one year period. Some duplication may occur in the participation of traditional registered students and industry training.

Additional plans include the initiation a series of Learning Logic Summer Math Camps, enrolling as many as 120 students per two-week session, for a total enrollment population of approximately 500 students. The summer math camps offer enrollment to high school students and community college students within the surrounding Appalachian communities.

2. The Learning Logic Program permits individual instruction with constant and on-going student evaluation on an instantaneous basis instead of an delayed or elongated evaluation and feedback period. The program provides the capability of reviewing the progress of a student momentarily.

The computerized methodology permits students to progress with a higher level of capability, allowing for individualized instruction to be customized for each student's capabilities and background.

The program has been proven to be extremely efficient in working with students to enhance their mathematical levels of competency as previously referenced in Section 6.0 of this proposal. Unfortunately, the Appalachian communities serviced by the Northeast Alabama State Community College suffer from a high incident of disabilities such as the visual and hearing impaired and a workforce with minimal education. Without the advanced technological programs such as Learning Logic that provides individualized and customized mathematical training, the student and workforce population will be deficient in competing in a local, state or global economy.

3. The Learning Logic Program will enable Northeast Alabama State Community College to develop and deliver a more efficient and effective tracking and evaluation mechanism of its "Asseting" and "Capping" system which monitors the progress of beginning freshmen through the completion of course requirements for each student's endeavors. As a result of this tracking and evaluation system, NASCC plans to effectuate a working relationship with community high school counselors to develop continuity in the educational endeavors required to transition a student from a high school environment to a community college environment.

In support of the Appalachian Regional Commission's goal and the State of Alabama's State Objective to support workforce readiness programs, NASCC's student enrollment encompasses many non-traditional college students. The students may be completing the GED program, participating in a JTPA program, or may be representative of a company as an employee participating in a specific training module.

In Jackson County, forty-two (42) percent of adults over the age of 25 do not have a high school education. In the calendar school year of 1997-1998, the Alabama Board of Education will require high school students to complete four years of mathematics prior to graduation. A great percentage of students will drop out of school because of the inability to comprehend and perform in a passing manner. This educational mandate has even a greater impact on the school-to-work programs, the current workforce, and the businesses and industries in the communities. The unskilled and uneducated workforce is a major deterrent in the enhancement of the economic prosperity of Appalachian Alabama communities and in competing in the world economy in the 21st century.

11.0 PROGRAM RESOURCES

UNIVERSITY OF SOUTH ALABAMA-SBDC COLLEGE OF BUSINESS AND MANAGEMENT STUDIES

not much
on specifics
of coordination

The USA-SBDC Director, Susan Armour, who has an extensive background in project management will provide the primary coordination for this program's implementation and continued deployment. The establishment of the demonstration facility and the related curriculum will be coordinated with Northeast Alabama State Community College. This demonstration activity will be used to generate additional support for deployment of the Learning Logic System.

CONSULTANT

Dr. William R. Boulton, President of Willam R. Boulton & Associates and an Olan Mills Professor of Strategic Management, has been a long time supporter of NSCF's Learning Logic programs. He has provided the leadership to initiate this proposal. His invitation to invite Dr. Fred Davison, NSCF's president, to Alabama lead to the current Learning Logic programs in the State. The extension of this program requires a basic infrastructure for use in education and training of students, teachers, and administrators across the range of government, academia, and business. As an outcome of the development of a facility at NASCC, the program will invite officials from the Junior Colleges across the Appalachian region to see first hand the capabilities of the Learning Logic program. Dr. Boulton will provide support in the coordination of this program and will ensure that it is carried out to meet its objectives. Dr. Boulton will be instrumental in developing a workshop for Junior Colleges, High Schools, and government officials to demonstrate the Learning Logic system. The workshop will demonstrate the result of this program to a broad audience in hopes of providing a wide-spread interest in its capabilities to improve math and science education across the Appalachian region.

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workshop
me (8/7)

Dr. B.

NORTHEAST ALABAMA STATE COMMUNITY COLLEGE (NASCC)

NASCC has been selected as the site for the Learning Logic laboratory since this program fits closely with the college's strategic direction. The college provides education and training to a wide student and business community in the North Alabama ARC region. It will provide the infrastructure for continued training of instructors, teachers and students in the area and around the Appalachian region. The staff instructors at the Northeast will promote regular courses as well as educational extension courses using the Learning Logic software.

The resumes of the combined resources of the University of South Alabama and Northeast Alabama State Community College are provided in Attachment 3.

12.0 PROPOSED COSTS

The total proposed costs for year one (1) are projected to be \$200,000. The requested ARC funds amount to \$160,000, (80%), with the remaining funding (20%) consisting of \$20,000 (10%) cash matching funds pledged by Northeast Alabama State Community College, and \$20,000 (10%) in-kind services supplied by the University of South Alabama-SBDC, College of Business and Management Studies, and William R. Boulton & Associates.

13.0 BUDGET

APPALACHIAN REGIONAL COMMISSION
STATE OF ALABAMA
FISCAL YEAR 1997-1998

	<u>ARC</u>	<u>SBDC</u>	<u>NASCC</u>	<u>MATCH</u>		<u>TOTAL</u>
				<u>CASH</u>	<u>IN-KIND</u>	
<u>PERSONNEL:</u>						
SBDC Dir.	30,000	0	0	0	10,000	40,000
SBDC COUNSELOR	10,000	0	0	0	0	10,000
Fringe (26) (% Varies)	10,400	0	0	0	0	10,400
TRAVEL	8,482	0	0	0	0	8,482
SUPPLIES	3,000	0	0	0	0	3,000
EQUIPMENT (NASCC)	70,000	0	0	0	0	70,000
CONTRACTUAL (NASCC)	0	0	0	20,000	0	20,000
CONSULTANT: OUTSIDE	20,000	0	0	0	10,000	30,000
OTHER EXPENSES (Train/Travel)	8,118	0	0	0	0	8,118
TOTAL DIRECT	160,000	0	0	20,000	20,000	200,000
WAVED INDIRECT	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
<u>TOTAL EXPENSES</u>	<u>160,000</u>	<u>0</u>	<u>0</u>	<u>20,000</u>	<u>20,000</u>	<u>200,000</u>

14.0 PROJECT COST ESTIMATE AND SCOPE OF WORK

The cost proposal is in response to the Appalachian Regional Commission's solicitation for grant applications for Human Resource Development and Economic Development in the area of education and training development activities. The following narrative provides cost data backup for the expenses of \$200,000 as set forth in the proposed budget. The column listed "ARC Funds" indicates the amount of grant funding being requested (\$160,000). The matching portion listed under "CASH" totaling \$20,000 indicates the cash amount NASCC pledges as cash match. The "In-Kind" column indicates the proposed amount of \$10,000 each that both the USA-SBDC and Dr. William R. Boulton & Associates will provide in services. The \$20,000 cash match and \$20,000 in-kind match proposes to support the 20 percent match of the ARC Learning Logic grant.

The details of the total proposed budget of \$200,000 and the scope of work include:

1. **PERSONNEL COSTS - \$40,000**

The ARC budget of \$40,000 is comprised of two (2) personnel for grant administration purposes, including documentation, reporting, organizational and program development. Personnel will be responsible for the primary coordination for the program implementation and continued deployment. These efforts will include the promotional effort of the program; co-generation of funds and resource contributions to support the implementation of the current program and follow-on programs to deploy across the Appalachian region.

Additional responsibilities will include:

- providing assistance and coordination to Northeast Alabama State Community College to establish and implement the laboratory and programs/courses;
- coordinate basic training for instructors at NASCC's training facilities in Augusta, Georgia;
- coordination and follow-through for the procurement of hardware and software requirements and the installation process;
- assist in the coordination of a training session for Appalachian high school principals and mathematics instructors, or representatives thereof, to preview the Learning Logic (L²) system at NASCC;

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NASCC*

SEP 24 1999

FINAL REPORT
Learning Logic Educational Program
Ending Date January 31, 1999

To the
Appalachian Regional Commission
Contract No. AL-12662-97

Prepared by
Susan Armour
Principal Investigator

September 16, 1999

Table of Content

			Page
Article 2 1-2	1.0	Introduction	1
Article 1 1-1(1) 1-1(2)	2.0	Parties Grantee Project Director, Grantee	1 1
Article 2 2-2 2-3 2-5 2-6 2-9.2 2-3(1) 2-3(2)	3.0 3.1	Scope of Services Project Objectives Specific Tasks Subcontracts Project Personnel Quarterly Progress Reports Training/Faculty Training /Administrative	1 1 2 2 2 2 2 2
Article 2 2-3(3)	4.0	Program Progress Activities Summer Quarter 1997 – Fall Quarter 1997 Winter Quarter 1998 Spring Quarter 1998 Summer Quarter 1998 Summer Secondary Program 1998 Fall Quarter 1998 Winter Quarter 1999 Projection	3 3 3 4 5 5 6 7
Article 2 2-9.2	7.0	Problems Encountered and Actions Taken	7
Article 2 2-9.3(1)	8.0	Recommendations	8
Article 2 2-9.3	9.0	Conclusion	9
		ATTACHMENTS	11
		Letters of Appraisal for the Learning Logic Educational Program	

FINAL REPORT
Appalachian Regional Commission
ARC Contract No. AL-12662-97
Learning Logic (L2) Educational Program

1.0 INTRODUCTION

Article 2

1-2 The University of South Alabama Small Business Development Center (USASBDC), Northeast Alabama State Community College (NASCC), Dr. William Boulton, and representatives from the National Science Center Foundation (NSCF) performed the following activities during the periods of May 1, 1997 through January 31, 1999, under the conditions specified in ARC Contract No. AL-12662-97. The Learning Logic Educational Program, a computerized-based educational laboratory, was established and implemented at the (NEASCC) in Rainsville, AL. The program provided training in the development of basic math, science and computer literacy skills for approximately 1100 community college students, adult industry training and day camps for high school students within a five county area.

2.0 PARTIES

Article 1

1-1(1) The "Grantee" of the Learning Logic Educational Program refers to the University of South Alabama, Office of Sponsored programs, 307 University Boulevard, AD 200, Mobile, AL 36688.

1-1(2) The Grantee's Project Director, Susan Armour, managed all project activities throughout the contractual period. A time extension was requested and granted by the Appalachian Regional Commission to extend through January 31, 1999.

3.0 SCOPE OF SERVICES

Article 2

2-2 The objectives of the project included:

1. Establish a computer based educational laboratory to train community college students, adult learners, industry re-training and public school students in the development of basic math, science and computer literacy skills.
2. Establish the physical infrastructure required to train students, teachers and workers in math.
3. Purchase a complete classroom system of hardware and software to effectively deliver the Learning Logic Program.

4. Provide a learning center to demonstrate the Learning Logic application for improving mathematical skills throughout the Appalachian Region.

2-3 Specific tasks included:

1. Training of NEASCC faculty in the Learning Logic methodology and the development of the curriculum work plan for implementation and continuation of the program.
1. Purchase of capital equipment, software, hardware, student furniture, and ancillary tools for the Learning Logic Laboratory installation.
2. Providing math skills instruction for NEASCC students and employees of area industries.
3. Conducting math camps for area high school and college students.

The specific objectives and tasks of the project were completed as of January 31, 1999.

Article 2 **3.1 Subcontracts**

- 2-5 Subcontractual arrangements were made with Dr. William Boulton, Auburn University, Auburn, AL. The scope of work to be performed was included in the contractual agreement with Dr. Boulton to assure effectuation of ARC objectives.
- 2.6.1 Project personnel providing the services specified in ARC Contract No. AL-12661 were selected by affiliation with the above referenced subcontractor to perform the specific tasks of the contractual agreement.
- 2-9.2 Progress reports were submitted to the ARC Project Coordinator, Eric Stockton; the State of Alabama Administration and Liaison Officer, Bonnie Durham; and to the University of South Alabama Office of Sponsored Programs. The information referenced in the reports reflected the progress and activities demonstrated during each quarter, and the forecast of the next quarter's activities. Additionally, the coordinated activities of the subcontractors were addressed, as well as any problems encountered and applicable actions taken.

Article 2

- 2-3(1.) During the week of August 3 – 8, 1997, six faculty from NEASCC trained at the National Science Center Foundation in Augusta, Georgia for the Learning Logic Program instructional and technical implementation instituted at the NEASCC. The participating faculty included Deborah Baker, Stephen Clements, Greg Millican, Tonie Niblett, Donna Richards and Sam Dobbs (Technical Adviser). The training period encompassed five days of intense training, in addition to the travel to and from Augusta.

Dr. William Boulton (Consultant) and Susan Armour (Principal Investigator) attended the Learning Logic Training Session during the week of August 20 – 23 in Augusta, Georgia. Discussions were held with representatives from the National Science Center Foundation in regard to the Learning Logic's future software and hardware developments and suggestions from the user's perspective in technology advances.

In August and September, NEASCC faculty formulated the curriculum requirements for all math classes to be presented in the Learning Logic methodology.

2-3(2.) During August through November, 1997, the Principal Investigator, faculty members and the technical staff were actively involved in the preparation of procuring computer equipment, software, workstation furniture, and the hardware wiring in preparation of an operational, 30 workstation laboratory. The Learning Logic Laboratory was fully operable on November 3, 1997. The hardware equipment was procured through the State of Alabama bid process. The Learning Logic software was purchased through the National Science Center Foundation. Northeast Alabama State Community College provided workstation furniture and textbooks.

2-3(3) The delay in the procurement and delivery of the computer equipment for the laboratory precluded students who were enrolled in the Fall Quarter, 1997, Elementary Algebra (MTH 108) from utilizing the computerized methodology with the exception of the last three weeks. Four of the five algebra classes were provided Learning Logic instruction and interaction, including the final examination for the quarter. A total of 117 students were enrolled in the classes.

Three topics were covered during the three week period interface with the Learning Logic methodology. After the first week, the students became familiar with the data entry process on the computers and soon mastered the assigned topics. Some frustration was experienced in a few areas of one topic and with the glossary. At one point, a total system downtime was experienced on a particular exercise. However, The National Science Center Foundation technical staff identified the problem relating to a faulty terminal and a server. The problem was resolved within several days. Initially, some students experienced anxiety during the first or second week of training. After continuing exposure to the methodology and computerized system, the anxieties dissipated. Due to the limited exposure of the computerized methodology, valid results could not be formulated for the Fall Quarter students.

On December 10, 1997, twenty-two eighth grade students and one teacher visited the Learning Logic Laboratory. The students were participants of an honors pre-algebra class at an area high school. They were given an orientation to Learning Logic and exposed to a topic included in the MTH 108 curriculum. The students worked in the laboratory for several hours without tiring or experiencing boredom. The students experienced minimal difficulty with the concept. The teacher was pleasantly impressed with the student's progress and understanding of the Learning Logic program and felt the program would be advantageous to be installed at her school. Ten of the students returned in the evenings to work in the laboratory for at least three hours several times a week.

The Winter Quarter classes commenced on January 5, 1998. Eighty-seven students (traditional and non-traditional) were enrolled in three Elementary Algebra (MTH 108) classes. Sixty-five students successfully completed the course, resulting in a higher-grade level than the traditional methodology course previously taught. Seven of the students enrolled in additional math courses not required for the program. Four faculty members

taught the winter quarter students. Grey Millican and Tonie Niblett taught MTH 108 day classes and Debbie baker and Steve Clements taught Math 108 evening classes.

Dr. William Boulton and Susan Armour coordinated with NEASCC Faculty in the development and administering of pre-test and post-test survey instruments for the students. Additional coordination was performed with Auburn Mathematics Department for assistance in the statistical analysis of student surveys for the winter quarter.

During the week of February 9 – 14, 1998, Dr. William Boulton, Susan Armour, and graduate Student, Paul Schwager, worked with NEASCC faculty (on site) to review program progress, problems, student activity and technology capabilities. Recorded interviews were conducted with students in both day and evening classes. Instructors were interviewed as well. The strategy for the Spring Quarter was discussed and planned with NEASCC.

High school teachers and administrators from surrounding counties were invited to visit the laboratory during this week. The visiting teachers and administrators were interested in pursuing the Learning Logic program for their respective schools.

Boulton, Armour and John Paul Campbell, Dean of Technology, NEASCC, visited Norandal USA, Inc. in Scottsboro, AL to prompt industry interest in the Learning Logic Program and discuss the progress of the eleven Norandal currently participating in the program. Norandal managers lauded the program which provided a means for advancement for the company's workforce by enlisting in the apprenticeship programs and preparing industry to compete in a global environment.

At the end of Course MTH 108, surveys for the Winter Quarter 1998 were distributed to students. Dr. William Boulton spearheaded the analysis of the student questionnaire data for the Winter quarter. The results were presented in the Progress Report for the period April 1, 1998—May 31, 1998. A problem occurred with the lack of completed questionnaires and the small sample size resulting in the analysis. It was found that the questionnaires from the students who dropped the course or joined the class mid-stream were included in the sample. The math faculty was advised of the problem and was corrected.

The Learning Logic Laboratory classes increased to eight during the Spring Quarter, with an enrollment of 150 students. In addition to four MTH 108 classes, two pre-algebra MTH 091 classes and two classes of MTH 111, intermediate algebra, were taught. At this point, all developmental mathematics classes below college algebra were instructed in the Learning Logic methodology. Teaching faculty members for the Spring Quarter included Tonie Niblett, Celestine Darnell, Donna Richards, Debbie Baker and Steve Clements.

One new adjunct faculty member was trained in the Learning Logic methodology due to the demand of student participation. Faculty members developed a training program for Alabama teachers working with Learning Logic. The program minimized cost for initial training and retraining for selected teachers, and minimized cost for travel and training in Augusta, GA. However, this particular focus did not exclude necessary training offered by the National Science Center Foundation in Augusta. Additionally, the NEASCC Math faculty cultivated an active user group program in Alabama for teachers and participants of the Learning Logic program.

During Summer Quarter 1998, eight classes were conducted daily at the Learning Logic Laboratory. Tonie Niblett, Paul Brooks, Debbie Baker and Steve Clements taught four classes of MTH 108 and two classes of MTH 111 two classes of MTH 091. Enrollment for the eight classes consisted of 120 students. Six students failed to complete their course work and were given an "Incomplete." Overall, the program was successful due to the expertise of the instructors and the enthusiasm of the students. The instructors coordinated their efforts to set standards and maintain consistency throughout the instructional period. Students were enabled to work in the laboratory outside their specific class period, with the flexibility of working with other instructors.

A new homework policy was instituted which provided students the option of receiving computerized homework before and during the mastery of a specific topic as opposed to receiving the homework after the topic had been mastered. The policy enabled students to practice more at home resulting in the mastery of topics more quickly.

The curriculum for MTH 091 was redesigned to emphasize remedial course work at the onset. The process provided a distinct advantage to older students who feared math in that it provided a review and concept understanding of basic fractions and math.

On May 7, 1998, NEASCC's Mathematics Honor Society sponsored an annual mathematics tournament. Approximately 500 junior and high school students competed in oral and written competition. Over 50 high school faculty sponsors, representing 25 secondary schools in eleven counties, participated in Learning Logic seminars. Dr. Fred Davidson, President of the NSCF; Dr. Charles Pendley, President, NEASCC; Edwin I. Gardner, Director, Alabama Department of Economic and Community Affairs; John Paul Campbell, NEASCC; Bonnie Durham, ARC Program Manager; Dr. William Boulton and Susan Armour participated in the program. The purpose of the participation was to promote and express success and appreciation for the Learning Logic Program.

The Summer Quarter 1998 Secondary Program (Summer Camp) was very successful in orienting area students in the Learning Logic methodology. During a period of six weeks, 30 high school and junior high school students participated in the program, representing five schools. The enrollment was limited to 30 students due to the number of computers available. However, students were encouraged to work in the lab outside of class periods providing availability of computers.

Math programs were designed for each student based upon their individual background and expectations from Learning Logic. The parents and faculty were extremely pleased with the student progress and the Learning Logic Program. The Summer Camp program promoted and informed the community about the Learning Logic Lab at NEASCC.

Dr. William Boulton spearheaded the student questionnaire pre- and post-tests to evaluate performance changes and behavior resulting from the use of the Learning Logic methodology. Ms. Angela Barlow, an Auburn Mathematics P.H. D. candidate assisted Dr. Boulton in the analysis. The analysis was provided in October 1998. All students participated in a test of competency in algebra and the following survey instruments:

- Student Aiken's Attitude Survey for Mathematics
- Student Phobos Survey of Mathematics Fright
- Student Sryvey of National Standards Goals for Algebra Content
- Student Survey to Survey to Assess Student's Learning Strategies for Algebra

- Student Learning logic generated Algebra test for pre-and post-test of student performance.

During the Fall 1998 period, NEASCC converted from a quarter system to a semester system. The mathematics course numbers changed, with one class dropping from a credit class to a non-transfer class. MTH 108 converted to MTH 098. As a result of a new policy on cut-off scores for placement tests, instituted by NEASCC, more students began math courses at a lower level. With these new requirements, it was more critical for students to complete courses as soon as possible and advance to the next course.

For the Fall semester, 274 students were enrolled in the Learning Logic Program. Three class of Pre-Algebra (MTH 091), eight classes of Elementary Algebra (MTH 098, and one class of Intermediate Algebra (MTH 100) were taught by instructors Donna Richards, Celestine Darnell, Debbie Baker, Greg Millican, Steve Clements, and Paul Brooks.

The Learning Logic Laboratory provided flexibility in the scheduling of classes for the Fall semester and subsequent semesters. Periodic meetings were held by the Learning Logic instructional team to iron out any difficulties. Many students felt that Learning Logic enabled them to build a good math background in a non-stressful way. A few of the students started the program at a very base level because of unsuccessful high school backgrounds or because they had never taken an algebra course. The Learning Logic Program continued to grow and improve the developmental studies program at Northeast Alabama State Community College.

The secondary outreach for junior and high school students during Fall 1998 continued to enroll new students and previous students from the Summer 1998 program. The full time faculty members discussed utilizing the Learning Logic Program for a proposed two to three week program for high school students through the Continuing Education Department at NEASCC.

Armour and Boulton continued endeavors to develop funding support for the CD-ROM and Internet applications for the Learning Logic concept by communicating with and visiting various companies and individuals.

Dr. William Boulton provided a written analysis and progress report on the ARC Learning Logic Grant for the summer semester on October 9, 1998. Overall, students significantly improved their mathematics skills as a result of the Learning Logic Program.

- The average number of correct answers increased from 3.3 to 20.6 from the pre-test to post-test period.
- The average level of anxiety for math decreased from 89.1 to 79.7 after taking a course using Learning Logic.
- Attitudes about algebra or math remained about the same, 78.4 and 79.2 upon the completion of Learning Logic.
- In all classes, significant improvement was achieved with average score improving from 47.7 to 73.8 between the pre- and post-tests.
- Average results improved from 38 to 80 over the pre-test from Class 091 and the post-test for 111.
- The learning strategy of students improved as a result of using the Learning Logic methodology.

- The averages increased slightly from 51.25 to 53.95, with students possibly having learned more ways of solving problems as a result of their experience. This primarily occurred in Math 108.

The Winter Semester Learning Logic Program served approximately 140 students and 11 classes. Participating instructors included Tonie Niblett, Celestine Darnell, Donna Davis, Paul Brooks, Steve Clements, and Debbie Baker. One change was made in that students could register for MTH 091, MTH 098, or MTH 100 at any time period that a teacher was scheduled in the lab. It was determined that an instructor could manage the different subjects at one time. As a result, the schedule became more flexible and allowed students to schedule a developmental class more easily.

On January 30, 1998, the Appalachian Regional Commission amended the period of performance to January 31, 1999. The amendment resulted as a consideration of the time delay for the start of the program and the delay of equipment installation. The amendment did not require additional ARC funding.

ARTICLE 2. 7.0 PROBLEMS ENCOUNTERED AND ACTIONS TAKEN

2-9.2

May – July 1997: The problems encountered related to the timeliness of the official notification of the ARC contract for the Learning Logic Program. Teacher training, equipment procurement, and laboratory preparation was totally dependent upon the official contract award. Lead times for procurement equipment, in addition to unexpected delays from vendor sources were not exceptional to the process. The State bid procedure was in line with expected timing once the contract was awarded.

August – October 1997: The problems encountered related to the timeliness of the procurement, delivery, and installation of the hardware and software for the Learning Logic Program. Once installed, only one problem occurred due to faulty Textronic equipment. The problem was resolved within several days.

The students enrolled in the Fall MTH 108 course were limited to two and one-half weeks of experience on Learning logic concepts and the interactive computerized methodology. However, the majority of students did not encounter any difficulty in becoming familiar with the program. With less than two weeks exposure to the computerized Learning Logic Program, sufficient timing was not warranted to evaluate the students for the present term.

January – March 1998: No hardware, software, administration or development problems were encountered with the Learning Logic program during this period.

Difficulty was encountered in the timely disbursements to contractors and in obtaining access to the project's financial status through the hosting institution.

April – May 1998: No hardware, software, administration or development problems were encountered with the Learning Logic program during this period. The principal investigator contacted Eric Stockton, ARC Program Manager, to discuss a budget

revision to the original submitted budget to ensure reimbursement payments for existing expenses for equipment installation by Northeast Alabama State Community College and the purchase of approximately six terminals to maximize the effectiveness of the Learning Logic Laboratory.

The University of South Alabama would not make payment to NEASCC until a budget revision was approved. The request for budget revision was forwarded to Eric Stockton under separate cover.

June – December 1998: No hardware, software, administration or development problems were encountered with the Learning Logic program during this period.

January 1999: No hardware, software, administration or development problems were encountered with the Learning Logic program during this period.

ARTICLE 2. **8.0 Recommendations**

2-9.3(1)

For future endeavors, it is recommended that the Appalachian Regional Commission replicate and support the Learning Logic Program in its entirety throughout the region. It will be necessary, at some time, to financially support the development of an on-line internet program through partnerships such as the National Science Center Foundation, corporations, foundations, and state and federal funding. Although the initial funding for development will be expensive, the cost of the program for individual schools will be less.

It is recommended that the Appalachian Regional Commission support the NEASCC in its endeavors to expand the present laboratory to accommodate additional students. A formal request was submitted to the Appalachian Regional Commission for the purchase of an additional PC server, tape drive, six terminals, and six keyboards for an approximate amount of \$10,000. The amount of this purchase did not require additional funding by the ARC. During this time, a change was made in the appointment for a Project Coordinator for the Learning Logic Educational Program by the Appalachian Regional Commission. Due to the non-availability of information and the contract being closed by the Grantee, University of South Alabama, it is not known by the Principal Investigator if the additional funding was provided. The principal investigator resigned from the University on January 8, 1999, at which time, the USA Sponsored Programs Office terminated the contract.

The last financial account statement forwarded to the principal investigator after her departure was dated December 31, 1998. A remaining balance available that was reported on this statement was \$41,239.05. No additional information was reported to the principal or communicated by USA Sponsored Programs regarding the closing of the contract on January 8, 1999. The principal investigator assumed the contract would end effective January 31, 1999.

It is suggested that the Appalachian Regional Commission contact the USA Sponsored Programs Office to gain information regarding the formal budget reporting and any additional information pertaining to changes or confirmation of additional budget approval.

ARTICLE 2. **9.0 Conclusion**

2-9.3

Northeast Alabama State Community College formally enrolled 940 full-time students in the Learning Logic Program, including 52 high school students. Additional high school students visited the laboratory at various times to gain an abbreviated knowledge of the program, with repeat visits to experience advanced development through Learning Logic. Tonie Niblet, Mathematics Department Head, provided additional exposure to junior high school students in the surrounding communities through the time frame of the grant. Fifty high school instructors have worked in the laboratory. The laboratory has been demonstrated to various groups of college and secondary educators as well as industry executives.

The general assessment of NEASCC's math faculty is that Learning Logic provides an excellent instructional method for students to build a strong background in mathematics. Since the program is self-paced, the slower students do not confine the progressive students. The slower-paced students who need the majority of assistance definitely benefit from the program. The Learning Logic Program is not perfect; however, it has proven beneficial for the developmental students than the traditional methodology. With the enactment of recent educational requirements for all high school students to take and pass four years of high school mathematics, the Learning Logic Program will prove to be the leading methodology in instructional mathematics. In the near future, instructional mathematics will be available via the computerized Internet services for instruction in every home.

In the Learning Logic Laboratory, students had access not only to their assigned teachers, but had access to any instructor participating in the program. The availability of instructors enabled developmental students to gain additional attention in support of their math needs and enhancement of deficiency skills. Additionally, two student tutors worked in the laboratory approximately 20 hours each to provide assistance to students. With the new higher placement scores mandated by Post-Secondary, NEASCC has enrolled twice as many developmental students. Without the laboratory, the college would suffer hardship to manage these students. With the new state mandated comprehensive final, the Learning Logic system enables the teachers to administer the test and track the results in a highly efficient manner.

The mathematical content of the program is excellent. The National Science Center Foundation consistently changes and upgrades the program. The NSCF is very attentive and responsive to each instructor's suggestions regarding the math content and format. The technical support is excellent and timely.

The concern that was encountered is that normal human procrastination works against the students. The average student must spend more time in the laboratory than just the allotted class time in order to complete the course. Some students have a difficult time realizing this until the end of the semester, which causes a hardship on the instructors with the last minute test taking and extra work requirements in the laboratory. The problem can be resolved. All students were expected to complete their course expectations within a certain time element, and with additional time for homework. This requirement stands for both Learning Logic and the traditional teaching methodology.

The majority of students reported that they liked the Learning Logic methodology. A few students did not care for the Learning Logic. At first, anxiety and a lack of computer skills for some of the older non-traditional students were voiced, but the fears were soon alleviated.

The accomplishments and benefits of the Learning Logic Program were fully accomplished. Due to the late implementation date of the program, 1100 students were not formally enrolled. Although 940 students were enrolled in the program, including the Secondary Program, it is felt that far more than 1100 students were exposed and benefited from the Learning Logic Educational Program. Many surrounding community colleges and high schools are actively pursuing the adoption of the Learning Logic Program.

The Appalachian Regional Commission made the Learning Logic Program possible. The program has been the single best improvement to developmental mathematics education that NEASCC has experienced. The Math Faculty experimented with many types of programs to evolve an individualized developmental study program to accommodate the varied backgrounds of the students. Learning Logic was recognized as the very best system for the developmental program. Attached are letters from the faculty and administration at NEASCC attesting to their experience with the Learning Logic Program.

Northeast Alabama State Community College is most grateful for the opportunity to pilot the Learning Logic Program. The College remains committed to continuing the Learning Logic Educational Program beyond the grant period. The program is a permanent system of instruction for mathematics at NEASCC.

ATTACHMENTS



NORTHEAST ALABAMA COMMUNITY COLLEGE
Technical Division



Office of the Dean
January 13, 1999

Mr. Eric Stockton
Project Coordinator
Appalachian Regional Commission
1666 Connecticut Avenue NW
Washington DC 20235

Dear Mr. Stockton:

I am very pleased to report the high degree of success that the Learning Logic (L²) Educational Program has had at Northeast Alabama Community College. This technology has greatly enhanced the delivery of mathematics instruction to our students. The most obvious benefit to the institution has been in the efficiency with which instruction is delivered to students with varying levels of mastery of subject material. The Learning Logic (L²) has enabled the department of math and science to schedule concurrent courses, which represents significant savings in instructional costs.

Perhaps a more significant benefit is the level of achievement demonstrated by the students in the developmental courses. These students are much more likely to succeed at higher levels of math due to their acquired competencies. The Learning Logic (L²) Laboratory has proven to be a valuable asset to students with weak math backgrounds and to non-traditional students who have not been exposed to classroom instruction for many years. An excellent example of this case is demonstrated by a group of apprentices from a local plant whose placement scores indicated a need for developmental studies in math. These apprentices were at high risk because of their math background and the rigorous curriculum that they face in electronics. The entire group remains enrolled and surely will now complete the three years of related training in their apprenticeship program. I am quite confident that a number of these men would not have made it through the traditional math courses and would not have gained the level of confidence needed to succeed in the electronics courses. The Learning Logic (L²) Laboratory has become a most valuable feature of our industry training program.

Approximately 300 high school and middle school students have been exposed to the Learning Logic (L²) program through math tournaments here on our campus and through a special class during the summer term for high school and middle school students. Area teachers have been given demonstrations in the learning Logic Laboratory, which provided an insight to the many options of instruction that can be made available to students.

Northeast Alabama Community College remains most grateful for the opportunity to pilot this program for two-year colleges in Alabama. We also remain committed to continuing the Learning Logic (L²) Education Program beyond the grant period. We consider the Learning Logic (L²) to be a permanent system of instruction for mathematics.

Sincerely,

John Paul Campbell
Dean of Technical Division

pab

Northeast AL State Comm Coll

January 13, 1999

To Whom It May Concern:

I am very pleased to write this letter concerning the Learning Logic program, a system of computerized mathematics instruction. The individualization of this system helps meet each student's personal needs. Because of one-to-one instruction and testing, each student has a complete understanding of a topic before he or she moves to the next. Coverage of the algebra topics is comprehensive to insure thoroughness. Since each student progress according his or her own ability and motivation, there is unlimited access to progression in the study of mathematics. Each student's achievement is not hampered by other students' lack of ability or lack of drive for achievement.

Based on my personal observation, I have found that pupils using this system develop a positive attitude about mathematics, have a lower failure rate, and obtain higher grades. Also, students that study through the Learning Logic system are more likely to continue the study of mathematics, and are more successful in higher level math courses. Students develop valuable computer skills and improve their ability to understand what they read. Students gain improved study habits and take more responsibility for their own learning.

Learning Logic is not just a gimmick to get students to use computers, but provides unparalleled educational opportunities for the study of mathematics. I am very happy to have the opportunity to use this system in my instruction.

Sincerely,



Paul Brooks, Instructor of Mathematics

January 9, 1999

To Whom It May Concern:

I taught two sections of MTH098 Elementary Algebra, and one section of MTH091, Developmental Algebra, in the Learning Logic Mathematics Lab during the fall semester 1998-99. I also taught one section of Elementary Algebra during the winter quarter of 1997-98.

First the "negative" aspects of Learning Logic, as I see them. To me, keying in homework along with answers during a lesson, can be a time-consuming process. However, the National Science Center does a good job of giving lengthy answers in multiple choice format so the student only has to click on the correct answer, rather than type in the entire answer. Also, another disadvantage is that the student cannot take the computer home with them and get ahead on a particular lesson. However, the student can take what we call "teacher homework" home with them.

Also, in the traditional classroom I would give considerably more homework than is given by the computer. I am sure the National Science Center does this to preserve the length of time required to enter homework answers, and for the amount of printer and paper use if a lot of homework was assigned. We do supplement with teacher homework.

The positive aspects of using Learning Logic are numerous, as I see them. The student learning math in the learning logic lab is more involved. He/she cannot kick back and become a passive observer watching the teacher do all of the work. Also, the student has two teachers--the computer and the instructor in the classroom at the time the student is working. I enjoy very much being able to help the students one-on-one with their math work. I am able to help them "where they are" rather than try to present a blanket lesson that covers the needs of the entire class.

For the student who is absent, the lab allows them to make up their work at any time without getting behind in their work. This is a big advantage! Also, the flexibility of having students in the same lab class completing different sections of material (MTH091, 098, 100) is convenient for the student.

Also, I like the fact that the student must LEARN before proceeding to the next topic. This is more time-consuming, but beneficial in the long run. The students that learn more quickly or have stronger math backgrounds do not have to wait on the students who need more time to grasp a concept. The slower student has the opportunity to succeed if he/she puts forth the time and effort required to be successful. I have witnessed students that would not have made it in the traditional classroom, make it in the Learning Logic Lab simply because they were not left behind by the instructor.

I have an overall good impression of Learning Logic, and I feel that the positives far outweigh the negatives. It will be interesting to see the comparison between the students in the lab versus the students in the traditional classroom.

Sincerely,


Greg Millican

Mathematics Instructor

Northeast Alabama Community College

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LEARNING LOGIC

Can you, as a teacher, be second banana to a computer? If not, the learning logic lab is not for you. Students learn primarily from their interactions with the computer. The teacher is available and necessary but not the main source of learning as I think he/she is in the traditional classroom. I miss actively teaching the material but I realize the value of the individualization offered in the lab. I consider it both a blessing and a curse that students can proceed at their own rate. Some students are too lax and undisciplined. These students often must make a mad dash with an explosion of activity at the end of the semester to complete all requirements.

Some of the examples and problems in 091 take too much time without a calculator. Percents should not have excessive digits in the decimal places. Weaker students have much difficulty with these types of problems. Of course, textbooks are not perfect either.

I am presently teaching mathematics in the lab for my third and fourth times. I enjoy it. Some days are busier than others. I wish students would ask more questions. There is practically no extra preparation or outside work for me the teacher. If a student misses a class, it is very easy to attend at another time to catch up. Missing a regular class is much more difficult to make up.

Ideally, I think we should offer the same courses both on and off computer to give students choices.

Celestine Dancie

It is still early in our experience with the Learning Logic Lab, and in most areas I have more questions than opinions about the advantages or disadvantages of computerized instruction. For example, will students in the lab be more successful in retaining knowledge than students in a traditional class? Will students make higher grades in the lab? Will the dropout rate be as high? I don't have answers to these questions but the following observations seem to be valid.

In a traditional class, many students will be frustrated because the instructor is moving too fast and they can't master the material at the instructor's pace. In the same class, many other students will be frustrated because the instructor is not moving fast enough and they are bored and not challenged. With the computerized instruction in the Learning Logic Lab, students are free to move at their own pace. This is the most obvious advantage of the Learning Logic program.

Some of our students with disabilities that limit their ability to take notes or to write responses to test questions have been more successful in the lab than in a regular classroom. Students who do not read well or who have limited computer skills may not be as successful in the lab as in a traditional classroom.

From the instructor's perspective, the day-to-day preparation for the computer lab is obviously much easier than for a traditional class since the computer program generates and grades homework and tests.

Donna Richards
Math Department
Northeast Alabama State Community College