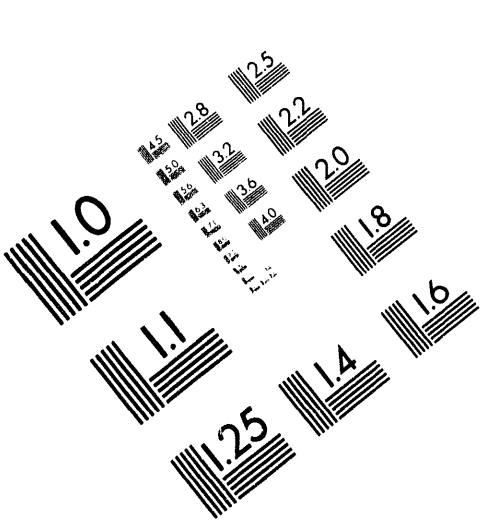

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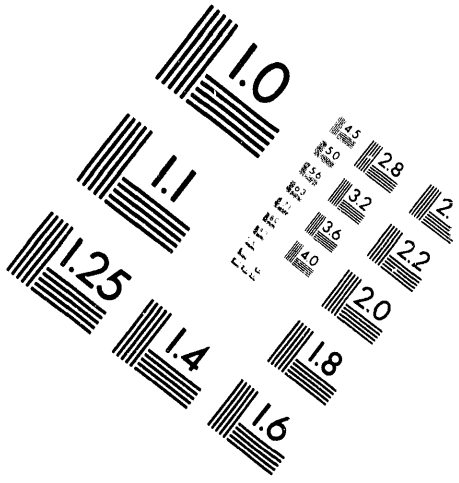
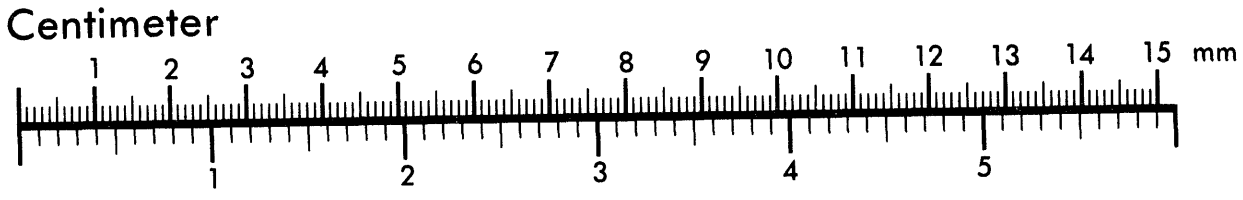
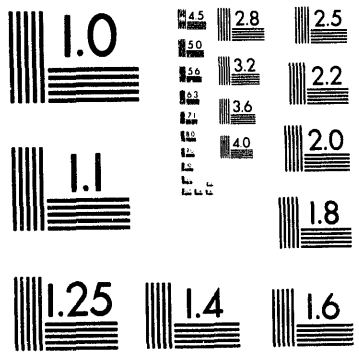
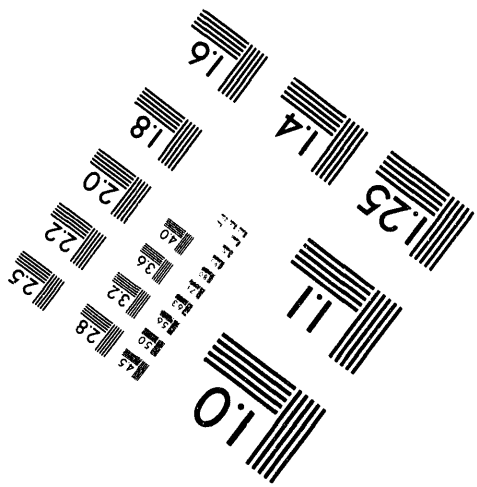
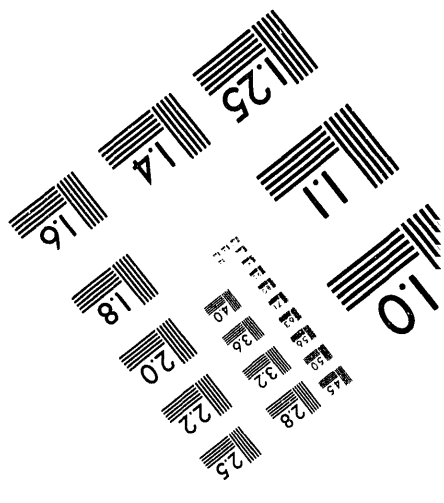










1 of 1

FINAL REPORT

GRANT No. DE-FG03-93SF20045/A000

PROJECT TITLE: "MULTICULTURAL AND MULTILINGUAL APPROACH: MATHEMATICS, SCIENCE, AND ENGINEERING EDUCATION FOR JUNIOR HIGH SCHOOL MINORITY STUDENTS AND HIGH SCHOOL ADMINISTRATORS."

SUBMITTED BY
THE COOPERATIVE DEVELOPMENTAL ENERGY PROGRAM
FORT VALLEY STATE COLLEGE

DISCLAIMER

PRINCIPAL INVESTIGATOR: ISAAC J. CRUMBLY, PH.D.
CO-PRINCIPAL INVESTIGATOR: JACKIE HODGES

During the 1993 school year, LLNL and the U.S. Department of Energy's San Francisco Field Office provided funds through grant #DE-FG03-93SF20045/A000 to assist CDEP with its network coalition of high school counselors from 19 states and with its outreach and early intervention program in mathematics, science and engineering for minority junior high school students. The program for high school counselors is called the National Educators Orientation Program (NEOP) and the outreach program for minority junior high school students is called the Mathematics, Science and Engineering Academy (MSEA). The MSEA and NEOP programs are the purpose of this report.

MATHEMATICS, SCIENCE, AND ENGINEERING ACADEMY JULY 11-31, 1993

A total of 35 minority and female rising eighth grade students participated in the Second Annual Mathematics, Science, and Engineering Academy (MSEA) sponsored by the Cooperative Developmental Energy Program of Fort Valley State College (FVSC). There were 24 students from the middle Georgia area, 4 students from Oakland, California, and 7 students from Portland, Oregon. Each student was selected by counselors in his or her respective school. The selection criteria were based on the students' academic performance in science and mathematics courses.

The students were given a pretest of 88 multiple choice questions on July 12, 1993 (Appendix 1). They were given the same exam July 30, 1993 the final day of the Academy. Of the 32 students who took both exams, 26 showed an improvement ranging from 1-20%.

All the class sessions and laboratory exercises included hands-on activities. Hands-on activities are excellent for reinforcing scientific principles.

Each student was required to evaluate the various segments of the 3-week program. A copy of the evaluation sheet can be found in Appendix 2. The activities that ranked highest among the students were as follows: telephone project & computer lab exercises; speakers Dr. Manual Perry of Lawrence Livermore National Laboratory and Janice Williams of Georgia Power Company; field trips to Six Flags, Scitrek, Coca Cola and Stone Mountain; extra-curricular activities including an Atlanta Braves Game, Talent Show and Quiz Bowl.

Some of the things the students complained about were early sessions (8:00 a.m.); meals (wanted fast food); bedtime (wanted later hours); and wanted more free time.

Overall the students enjoyed the program and gave very good comments about the summer experience. Many of them stated that they wanted to come again in 1994.

BACKGROUND AND INTRODUCTION

In 1983, FVSC received start-up funds ($58,000 grant) from the U.S. Department of Energy's Office of Minority Economic Impact to develop an innovative Cooperative Developmental Energy Program (CDEP). The objective of CDEP is to develop a long-term synergistic mutually beneficial relationship between FVSC and the private and governmental sectors of the nation's energy industry in creating a technology-oriented labor base for minorities and women. This objective is accomplished by (1) developing energy and environmentally-related disciplines; (2) offering dual-degree programs in electrical engineering and geosciences via collaborative arrangements between FVSC and the University of Nevada, Las Vegas and Oklahoma University; (3) developing internship/co-op assignments for students; (4) forming participatory alliances with energy companies and governmental agencies; (5) forming alliances with high school counselors in 19 states; and (6) developing a mathematics, science, and engineering academy for junior high school students.

During the past 11 years, FVSC's CDEP program has enjoyed the following successes:

*CDEP students have participated in 499 internship/co-op assignments from which they have earned over $ 1.6 million to help finance their education.

*Awarded over $3.2 million in scholarships to academically talented minority and women students.

*Developed 3+2 dual-degree programs in mathematics/electrical engineering and in chemistry or mathematics/geosciences between FVSC and the University of Nevada Las Vegas and Oklahoma University, respectively.

*Formed two consortia to financially support the two dual-degree programs. The two consortia have generated more than $3.4 million since 1990.

*Formed participatory alliances with over 40 energy companies and governmental agencies.

*Formed a network coalition with high school counselors from 19 states to identify, recruit and recommend academically talented minority and female students for the FVSC CDEP program.

*Developed an outreach and early intervention program in science, mathematics, and engineering for minority junior high school students.

The students gained valuable knowledge and insight from the academy. They were introduced to career fields they had never studied before (engineering and geology); additionally they established very close friendships and became part of a human resources pipeline that has scholarship possibilities upon high school graduation.

NATIONAL EDUCATORS ORIENTATION PROGRAM
September 30-October 2, 1993

The National Educators Orientation Program (NEOP) is an important part of the recruitment of minorities for careers in the Energy Industry. It is CDEP's goal to recruit talented students on a national level. CDEP has targeted nineteen (19) states as its primary area. However, at the present time CDEP has on staff one (1) full time recruiter. Therefore, to achieve its recruitment goals as effectively and economically as possible, the idea was conceived by Dr. Isaac J. Crumbly, Director of CDEP, to physically bring educators from the target states to Fort Valley State College.

The logic for creating NEOP is based on two (2) basic facts relative to CDEP's recruitment strategy. First, Fort Valley State College, the base campus for CDEP, enrolls the majority of its students from two (2) states, Georgia and Florida. Therefore, Fort Valley State does not have significant "name recognition" on a regional or national level which makes student recruitment outside of these two states difficult. Secondly, the normal marketing approach to expand a schools recruitment area is to attend large college recruitment fairs in the states targeted for development. This approach can be effective; however, it is expensive and is best suited for schools who have national name recognition.

Therefore, NEOP is a more effective and economical way to achieve CDEP's goals. First, by bringing educators directly to Fort Valley State College, it totally eliminates the competition in capturing the attention of educators from CDEP's targeted states. Therefore, NEOP instantly creates an awareness and "name recognition" for Fort Valley State College. This strategy then creates a situation whereby Mr. Brown, CDEP's recruiter, will not need to physically visit each state. By marketing CDEP directly to the educators, CDEP has created a secondary group of recruiters in each targeted state. This will save thousands of dollars in travel and marketing campaigns.

Purpose:

NEOP provides an opportunity for high school educators from across the country to visit and receive detailed information on Fort Valley State College, Oklahoma University, University of Nevada at Las Vegas and the dual-degree programs in electrical engineering and geosciences.

Educators Participation:

NEOP has been held at Fort Valley State College for three consecutive years. The last conference was held on September 30 through October 2, 1993. Sixty one (61) educators from fifteen (15) different states, including Alaska, were in attendance for the weekend conference. Attached is a map showing CDEP target states and the number of educators from each state that have participated in NEOP (Appendix 3).

Impact on CDEP's Recruitment:

NEOP has been the single most important factor in the success CDEP has achieved in such a short period of time. From our first conference in the Fall of 1991, CDEP increased its scholarship enrollment from eleven (11) students to a total of twenty seven (27) students for the Fall of `92. This is a 145% increase in a one year period. The freshman class of `93 had a total of twenty eight (28) students. We are projecting an enrollment of forty (40) students for the freshman class of `94.

The Fort Valley State College's administration and the CDEP staff are eternally grateful to LLNL and DOE's San Francisco Operations Office for providing the funding for MSEA and NEOP during 1993.

Appendix 1
Pretest/Post test

JULY 12, 1993 NAME_____

MATH, SCIENCE AND ENGINEERING ACADEMY
PRETEST

1. ____ A geologist who studies dinosaurs is called a
   a) petrologist
   b) saurologist
   c) invertebrate paleontologist
   d) vertebrate paleontologist
   e) structural geologist

2. ____ To find out what dinosaurs ate, geologists study ___.
3. ____ To find out if the dinosaur lived in swamps or deserts, geologists study ___.
4. ____ To find out how fast the dinosaur moved, geologists study ___.
5. ____ To find out the posture of dinosaurs, geologists study ___.

   a) bones
   b) teeth
   c) trackways
   d) surrounding rocks

6. ____ Which of the following is <u>NOT</u> produced from petroleum?
   a) plastic drinking cups
   b) balloons
   c) fertilizers
   d) steel
   e) shampoo

7. ____ The greatest known reserves of oil and gas are found in
   a) the United States
   b) the Former Soviet Union (USSR)
   c) the Middle East
   d) Africa
   e) Japan

8. ____ The United States
   a) has adequate oil reserves for the next 200 years
   b) has almost no oil reserves and must import all of its oil
   c) has some oil reserves but still must import about 50% of its oil
   d) produces much more oil than it needs

9. ____ Most of the kaolin mined in Middle Georgia is used as
   a) gemstones
   b) a filler and coating in manufacturing paper
   c) building stone
   d) raw material for cement

10. ____ The normal sequence of fluids found in an oil field is
a) gas (top) - oil - water (bottom)
b) water (top) - oil - gas (bottom)
c) oil (top) - water - gas (bottom)
d) oil (top) - gas - water (bottom)

11. ____ What kind of rock is most likely to contain an oil and gas deposit?
a) salt
b) granite
c) sandstone
d) shale

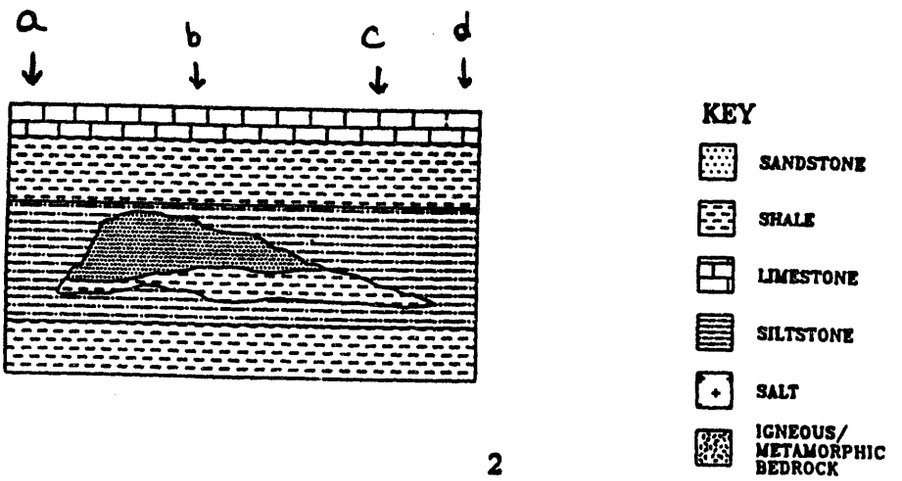
12. ____ The volume of storage space in a rock is the ___.
13. ____ The relative ease of fluid flow through a rock is the ___.
14. ____ The inability of two fluids to mix is ___.
15. ____ The mass of a substance per unit volume is the ___.

a) density
b) immiscibility
c) permeability
d) porosity

16. ____ A geologic barrier that stops the migration of oil and gas is a ___.
17. ____ A rock that contains spaces for oil to accumulate is a ___.
18. ____ An impermeable rock that prevents oil and gas from migrating further is a ___.
19. ____ A rock that contains organic matter that can be converted to hydrocarbons by heat and pressure is a ___.

a) reservoir rock
b) seal
c) source rock
d) trap

20. ____ On the following diagram where would you drill to find oil?



21. ____ Which of the following events might cause the price of oil to fall?
a) the discovery of a huge new oil field increasing oil supplies
b) a war in the Middle East reducing available supplies
c) a mild winter causing a drop in demand
d) reduced production from Saudi Arabia decreasing supplies

22. ____ Buys leases to drill for oil.
23. ____ Operates drilling rigs.
24. ____ Provides loans for drilling.
25. ____ Pays taxes.

a) banker
b) drilling company
c) oil company
d) all of the above

26. ____ pH is used to determine
a) salinity and sweetness
b) oiliness and dehydration
c) acidity and alkalinity
d) solubility and suspension

27. ____ Chemical changes are always associated with the gain or loss of energy in the form of
a) gas
b) water
c) heat
d) radioactivity

28. ____ The separation of the chemical components of a compound by the mobility of the components in solvent as it passes through a porous material such as paper is known as
a) heating
b) distillation
c) chromatography
d) chemical analysis

29. ____ The separation of the mixtures of carbon compounds by the differences in boiling points is known as
a) heating
b) distillation
c) chromatography
d) chemical analysis

30. ____ Acids and alcohols react to form
a) ester and water
b) oils and gas
c) gas and water
d) salt and water

31. ____ The photosynthetic pigments of plants are
a) water, oxygen, and sugars
b) DNA and mitochondria
c) various types of chlorophyll
d) various types of proteins and nuclei

32. ____ Evidence scientists have for ancient animals and plants comes from
a) examination of soil layers
b) Darwin's theory of evolution
c) fossils
d) analysis of glaciers

33. ____ Which of the following is more likely to be found in geological rock layers
a) a tooth
b) muscle tissue
c) feathers
d) all of the above

34. ____ Soil and water mixed together will produce
a) a compound
b) an element
c) a suspension
d) a solution

35. ____ A system involving the interactions of living organisms with their physical environment is
a) a biome
b) an ecosystem
c) an environment
d) earth

36. ____ The soil characteristics of a region determine
a) the types of vegetation
b) elevation
c) climate
d) all of above

37. ____ The temperature at which liquid becomes a gas is known as the
a) freezing point
b) boiling point
c) transition temperature
d) distillation temperature

38. ____ Plants and animals share the following characteristics
a) similarity of structure and function
b) adaptation and mobility
c) the need for oxygen and carbon dioxide
d) the ability to grow and reproduce

39. ____ Plants do the following EXCEPT
a) provide nitrogen required by all life forms
b) provide oxygen required by many life forms
c) provide a means of decreasing soil erosion
d) are reservoirs of moisture close to the earth

40. ____ One consequence of burning fossil fuels may be
a) global cooling
b) increasing the risk of wide-spread radiation exposure
c) acid rain
d) loss of crop land

41. ____ The scientific method involves
a) the development of hypotheses and conclusions
b) observation, experimentation, and conclusion
c) observation and experimentation
d) observation, development of hypotheses, and experimentation

42. ____ Milliliter is a unit used to measure
a) mass
b) volume
c) temperature
d) distance

43. ____ The following will make water unsafe to drink
a) presence of coliform bacteria
b) presence of fluoride
c) softness or hardness of water
d) pH between 6 and 8

44. ____ The burning of fossil fuels, production of hydroelectric power and photosynthesis are examples of
a) the scientific method
b) biological and technological evolution
c) the first law of energy and matter
d) nonrenewable resources

45. ____ Reduction of most forms of pollution will require
a) technological and society changes
b) an understanding of the interdependence of all life forms
c) recycling
d) all of the above

46. ____ Identification of an unknown compound involves detecting the presence and/or absence of
a) specific ions or metals
b) specific inorganic or organic groups
c) specific physical and/or biochemical properties
d) all of the above

47. ____ All life forms are ultimately dependent upon the following group of living organisms
a) bacteria - Kingdom Monera
b) plants - Kingdom Plantae
c) fungi - Kingdom Fungi
d) algae and protozoa - Kingdom Protista

48. ____ Proteins, carbohydrates, lipids, and nucleic acids are
a) elements
b) chemical mixtures
c) organic compounds
d) solutions

49. ____ Decayed remains of plants and animals are the building blocks of
a) nuclear energy
b) solar energy
c) geothermal energy
d) fossil fuels

50. ____ Scientists often use graphs and charts to
a) illustrate the findings of experiments
b) to draw conclusions
c) to predict future results
d) none of the above

51. ____ The standard frequency used in U.S. households is
a) 70 Hz b) 60 Hz c) 50 Hz d) 120 Hz e) 100 Hz

52. ____ Two triangles are similar if
a) one angle of the two triangles is the same
b) two angles of the two triangles are the same
c) one side of the two triangles is the same

53. ____	How fast a charge flows through the conductor	a) power b) electric current
54. ____	How fast an object moves from one place to another	c) speed d) acceleration
55. ____	The rate at which velocity changes	
56. ____	The rate at which energy is changed from one form to another	

57.____	The unit for current	a) Ohm
58.____	The unit for voltage	b) Hertz
59.____	The unit for resistance	c) Ampere
60.____	The unit for capacitance	d) Farad
61.____	The unit for frequency	e) Volt

62.____ The unit for energy
63.____ The unit for work
64.____ The unit for force
65.____ The unit for speed
66.____ The unit for power

a) Newton
b) Meter/sec
c) Watt
d) Newton-meter
e) Joule

67.____ A moving object has
68.____ A book on the top shelf has
69.____ Burning wood has
70.____ A charged particle has
71.____ A fission reaction releases

a) nuclear energy
b) heat energy
c) potential energy
d) electrical energy
e) kinetic energy

72. ____ In an open circuit, the resistance is
73. ____ In a short circuit, the resistance is
74. ____ The kind of voltage you get from a battery
75. ____ The kind of voltage you get from a wall outlet

a) infinite
b) DC voltage
c) zero
d) AC voltage

76.____ The center of an atom is called a
77.____ The particle found orbiting the center of an atom is called a
78.____ The particle with positive charge found in center of an atom is called a
79.____ The particle with no charge found in the center of an atom is called a

a) proton
b) neutron
c) electron
d) nucleus

80.____ The force that holds a material together is called
81.____ The force that causes a liquid to behave as if it had a thin film over it is called
82.____ The tendency of liquids to rise in small tubes is called
83.____ The sticking together of two unlike substances is called

a) surface tension
b) cohesion
c) adhesion
d) capillary action

84.____ The "brain" of the computer is called

85.____ The computer's work area is called

86.____ The means the computer uses to take in or send out data is called

87.____ The place where the computer keeps its data when is's not in use inside the computer's memory is called

88.____ The instructions that tell the computer what to do is called

a) programs
b) input/output
c) central processing unit (CPU)
d) memory
e) disk storage

Appendix 2
Evaluation Instrument

Fort Valley State College

CDEP

Mathematics, Science, & Engineering Academy

Summer, 1993

Evaluation

	Poor	Average	Good	Very Good	Excellent
Instructors					
Engineering					
Stimulated class discussion	1	2	3	4	5
Made me want to learn	1	2	3	4	5
Explained concepts clearly	1	2	3	4	5
Used interesting examples	1	2	3	4	5
Geology					
Stimulated class discussion	1	2	3	4	5
Made me want to learn	1	2	3	4	5
Explained concepts clearly	1	2	3	4	5
Used interesting examples	1	2	3	4	5
Science					
Stimulated class discussion	1	2	3	4	5
Made me want to learn	1	2	3	4	5
Explained concepts clearly	1	2	3	4	5
Used interesting examples	1	2	3	4	5
Multi-cultural					
Stimulated class discussion	1	2	3	4	5
Made me want to learn	1	2	3	4	5
Explained concepts clearly	1	2	3	4	5
Used interesting examples	1	2	3	4	5
Projects					
Telephone					
gained hands-on experiments	1	2	3	4	5
learned how to read instructions	1	2	3	4	5

	Poor	Average	Good	Very Good	Excellent
Computer labs	1	2	3	4	5
gained hands-on experiments	1	2	3	4	5
learned how to read instructions	1	2	3	4	5
Made me want to learn	1	2	3	4	5
Explained concepts clearly	1	2	3	4	5
Geology labs					
gained hands-on experiments	1	2	3	4	5
learned how to read instructions	1	2	3	4	5
Science Labs					
gained hands-on experiments	1	2	3	4	5
learned how to read instructions	1	2	3	4	5
Speakers					
Dr. Manual Perry					
"To be the best you can be"	1	2	3	4	5
Romelda Simmons					
"How to get along with individuals from different backgrounds"	1	2	3	4	5
Janice Williams					
Georgia Power/Electricity	1	2	3	4	5
William Burnette					
Engineers	1	2	3	4	5
John Taylor					
Study Skills	1	2	3	4	5
Romelda Simmons					
Career Planing	1	2	3	4	5
Field Trips					
Museum of Arts & Science	1	2	3	4	5
Harriet Tubman Museum	1	2	3	4	5
Kaolin Mine	1	2	3	4	5
Montezuma-Mennonite visit	1	2	3	4	5
Ocmulgee Indian Mounds	1	2	3	4	5
Scitrek	1	2	3	4	5
Fern Bank	1	2	3	4	5
Underground Atlanta	1	2	3	4	5
Stone Mountain	1	2	3	4	5
Coca-Cola	1	2	3	4	5
Martin Luther King Center	1	2	3	4	5
Six Flags	1	2	3	4	5

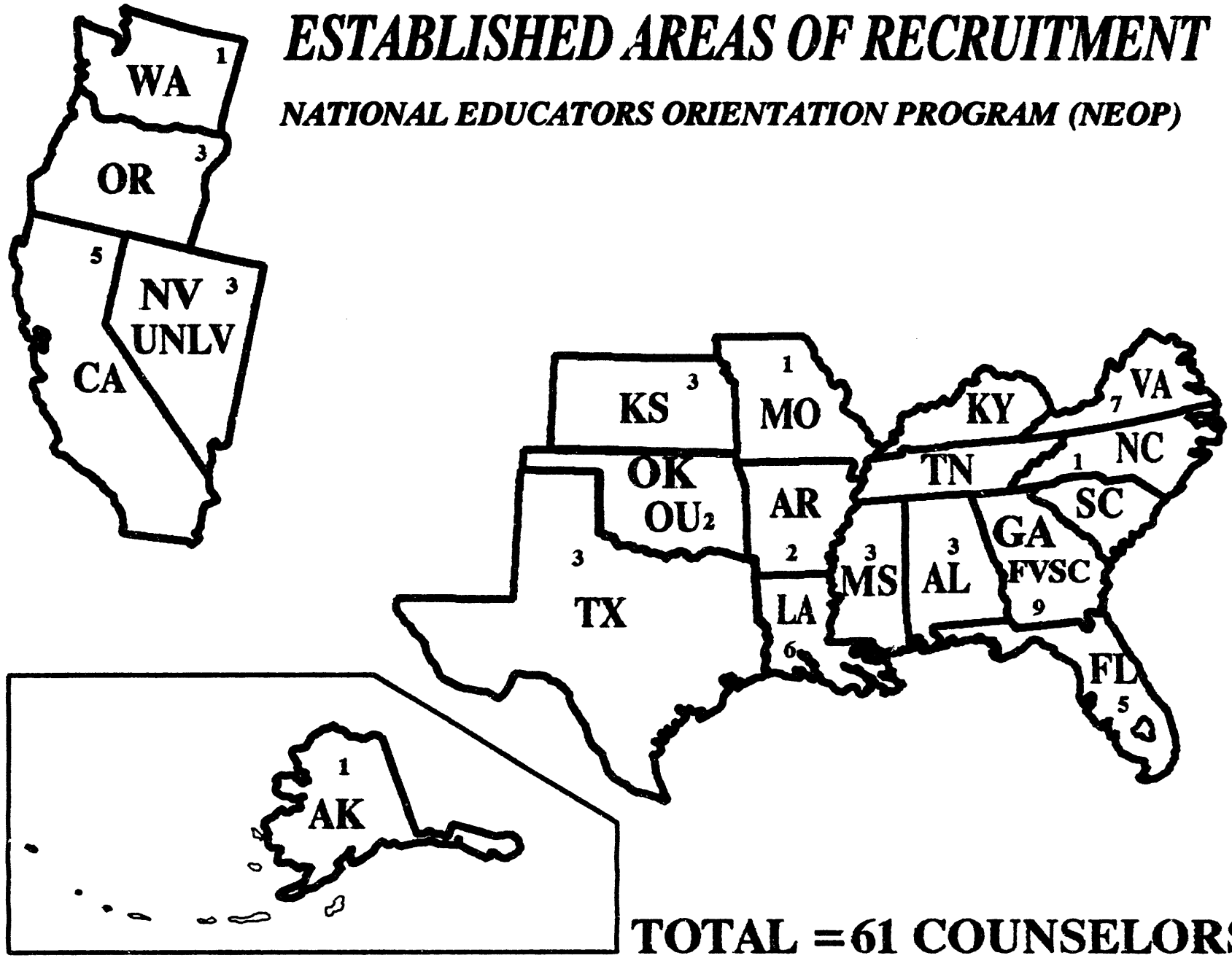
	Poor	Average	Good	Very Good	Excellent
Extr-curricular activities	1	2	3	4	5
Play "Runaways"	1	2	3	4	5
Ethnic Doll Exhibit	1	2	3	4	5
Movies	1	2	3	4	5
Dance	1	2	3	4	5
Etiquette Tips	1	2	3	4	5
Goat Seminar	1	2	3	4	5
Atlanta Braves Game	1	2	3	4	5
Macon Mall	1	2	3	4	5
Talent Show	1	2	3	4	5
Quiz Bowl	1	2	3	4	5
Electric Car	1	2	3	4	5
Cookout/Swimming	1	2	3	4	5
Counselors					
Tameka Jackson					
Courteous	1	2	3	4	5
There when needed	1	2	3	4	5
On time	1	2	3	4	5
Anthony Finney					
Courteous	1	2	3	4	5
There when needed	1	2	3	4	5
On time	1	2	3	4	5
Quentin Smith					
Courteous	1	2	3	4	5
There when needed	1	2	3	4	5
On time	1	2	3	4	5
Dawn Glover					
Courteous	1	2	3	4	5
There when needed	1	2	3	4	5
On time	1	2	3	4	5
Meals					
Breakfast	1	2	3	4	5
Lunch	1	2	3	4	5
Dinner	1	2	3	4	5
Housing					
Bedroom					
Clean	1	2	3	4	5
Comfortable	1	2	3	4	5
Bathroom					
Clean	1	2	3	4	5

Comments

APPENDIX 3
MAP OF TARGET RECRUITMENT STATES
INCLUDES NUMBER OF NEOP EDUCATORS FROM EACH STATE

ESTABLISHED AREAS OF RECRUITMENT

NATIONAL EDUCATORS ORIENTATION PROGRAM (NEOP)



TOTAL =61 COUNSELORS

DATE
FILMED
10/19/94
END