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ADVISOR'S APPROVAL 

A PROPOSED SCIENCE PROGRAM

FOR A SCHOOL SYSTEM

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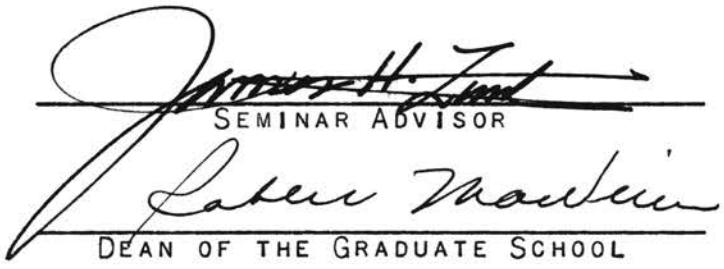

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DEAN OF THE GRADUATE SCHOOL

PREFACE

With the ever increasing number of high school graduates endeavoring to secure some form of advanced education, and with the emphasis in this training being placed more and more upon science and technology, high schools are now faced with the problem of evaluating the course offerings and determining which courses will best prepare the students for this advanced training.

Attention needs also to be directed toward the education of those students who will not be seeking advanced training, but who will become employed in industries that need people who can be trained to perform skills that are becoming more technical.

In general, regardless of the degree of specialization in their training and the specific occupations and professions for which they will be trained, all students need to be able to apply scientific knowledge to new problems and situations. They need to be able to read and evaluate news articles and popular writings on scientific developments. They should be able to understand the point of view with which a scientist approaches his problems, and the kinds of things he does. Ability to analyse scientific data summarized in maps, tables, curves, charts, and graphs is becoming more and more a part of everyday life. Students need

TO UNDERSTAND THE ROLES, IMPORTANCE AND LIMITATIONS OF SCIENCE IN THE MODERN WORLD AND TO BE ABLE TO FACE FACTS, REVISE JUDGEMENTS, AND TO CHANGE BEHAVIOR IN THE LIGHT OF APPROPRIATE EVIDENCE. FINALLY, THEY NEED TO RECOGNIZE THE NEED FOR ADDITIONAL SCIENCE KNOWLEDGE IN A SITUATION AND THEY NEED TO KNOW HOW TO ACQUIRE IT.

THE SCIENCE PROGRAM AS OUTLINED IN THIS REPORT MIGHT BE ADAPTED BY OTHER SCHOOL SYSTEMS AFTER CERTAIN MODIFICATIONS ARE MADE, BUT IT IS DESIGNED WITH A SPECIFIC SYSTEM IN MIND AND THEREFORE CONTAINS SOME UNIQUE APPROACHES TO SOME OF THE PROBLEMS OF SCIENCE EDUCATION. THE WRITER IS FAMILIAR WITH THE SYSTEM, HAVING GRADUATED FROM THE SCHOOL AFTER ATTENDING IT FOR NINE YEARS AND HAVING TAUGHT THERE FOR FIVE AND A HALF YEARS PREVIOUS TO THE PRESENT COLLEGE ATTENDANCE.

ONE OF THE CHIEF PURPOSES OF THE PROGRAM IS TO PROVIDE ALL STUDENTS WITH A CONTINUOUS AND MEANINGFUL EXPERIENCE IN SCIENCE EDUCATION. THIS EXPERIENCE WILL BEGIN IN THE LOWER ELEMENTARY GRADES AND WILL CONTINUE THROUGH THE SENIOR YEAR OF HIGH SCHOOL. ALLOWANCES ARE MADE FOR THE DEVELOPMENT OF INDIVIDUAL DIFFERENCES, ESPECIALLY AT THE HIGHER LEVELS.

THE PROGRAM PROVIDES FOR THE EARLY IDENTIFICATION OF STUDENTS WITH EXCEPTIONAL ABILITIES AND APTITUDES AND PROVIDES FOR A MORE COMPLETE DEVELOPMENT OF THESE ABILITIES BY PROVIDING SPECIAL ACADEMIC OPPORTUNITIES WHICH DO NOT INFLICT THEIR SPECIALIZATION ON THOSE STUDENTS WHO ARE NOT CAPABLE OF DEALING WITH THEM.

Special concern is directed to acquainting the student with the many occupational and professional opportunities afforded by the geographical and economic location of the school system. Emphasis upon the requirements of these vocations and professions will me made at an earlier age than has previously been done so that the student may prepare more completely for a career.

Though circumstances may alter the development of the program, it will serve to satisfy a current need in science education, it can continue to serve that need by continual evaluation and reorganization, and it may serve to stimulate the evaluation and reorganization of other subject areas in the school system.

Indebtedness is acknowledged to Dr. James H. Zant for his valuable guidance in the writing of this report, to the members of the faculty of Oklahoma State University under whom it has been my pleasure to work this year and who have inspired much of the desire to establish this program, and to former students who have made me aware of many of the problems and inadequacies of science education as they have experienced it.

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CHAPTER I

INTRODUCTION

THE SCHOOL SYSTEM FOR WHICH THIS SCIENCE PROGRAM IS PROPOSED IS LOCATED IN A TOWN OF ABOUT 10,000 POPULATION. ALTHOUGH THERE ARE MANY MAJOR INDUSTRIES IN THE VICINITY, ONLY MINOR INDUSTRIES AND BUSINESSES ARE FOUND IN THE DISTRICT. THE INDUSTRIES ARE COMPRISED MAINLY OF THOSE CONCERNED WITH THE REFINING OF PETROLEUM AND THE PRODUCTION OF ORGANIC CHEMICALS. BECAUSE OF THE LOCATION RELATIVE TO THESE INDUSTRIES, THE TOWN IS RAPIDLY BECOMING A RESIDENTIAL AREA AND THE POPULATION IS INCREASING.

AS A RESULT OF THIS INCREASE IN POPULATION, THE HIGH SCHOOL ENROLLMENT IS EXPECTED TO MORE THAN DOUBLE IN THE NEXT FIVE TO SIX YEARS. A BUILDING PROGRAM IS UNDER WAY TO TAKE CARE OF THIS INCREASED STUDENT BODY.

EVEN WITHOUT THIS INCREASE IN NUMBER OF STUDENTS TO BE CONSIDERED THERE HAS EXISTED A GROWING NEED TO IMPROVE THE OFFERINGS IN SCIENCE IN THE GRADE SCHOOLS AS WELL AS IN THE HIGH SCHOOL. WITH THE ACCELERATED DEVELOPMENTS IN SCIENCE AND THE STEADILY INCREASING DEMANDS FOR TECHNICAL SKILLS MADE BY THE INDUSTRIES IN THE AREA, AN ORGANIZED PLAN FOR IMPROVING THE SCIENCE PROGRAM IS NEEDED.

THE PURPOSE OF THIS REPORT IS TO OUTLINE A POSSIBLE SCIENCE PROGRAM WHICH CAN BE ESTABLISHED IN THE SCHOOL SYSTEM AND TO DESCRIBE THE DUTIES OF A SUPERVISOR OF SUCH A

PROGRAM. THIS REPORT IS TO BE SUBMITTED TO THE ADMINISTRATION AND TO THE BOARD OF EDUCATION FOR THEIR CONSIDERATION AND APPROVAL.

IN OUTLINING THE PROGRAM, FOUR MAIN PHASES WILL BE CONSIDERED: AN ELEMENTARY PROGRAM, AN INTERMEDIATE GRADE PROGRAM, A HIGH SCHOOL PROGRAM, AND A SUMMER PROGRAM WHICH WILL INCLUDE ACTIVITIES FOR STUDENTS OF ALL GRADE LEVELS. THE FINAL CHAPTER WILL DEAL WITH THE ESTABLISHMENT OF THE PROGRAM AND THE IMMEDIATE STEPS NECESSARY FOR THIS ACCOMPLISHMENT.

CHAPTER II

THE ELEMENTARY PROGRAM

In general, the elementary science program is in need of improvement. The only science taught is incidental to the reading program or is the result of class discussions of incidents or items of interest. There are several reasons for the exclusion of science from the elementary curriculum, but outstanding among these reasons is the inadequate training of elementary teachers in the methods of science teaching. The following plan has as its purpose the enrichment of the science experiences in the elementary grades, and has as its ultimate goal the inclusion of a planned course of study in science throughout the elementary grades.

To initiate the science program, the supervisor will make scheduled visits to the elementary classes, either singly or combined by grade levels, for the purpose of conducting demonstrations of some of the basic fundamentals of science. These demonstrations will be planned to correlate with the reading and discussion activities of the classes, and will be designed to minimize duplication as the student progresses from one grade to the next. These demonstrations will serve two purposes at least. In addition to providing increased opportunities for the students to gain a better insight into the fundamentals of science, the demonstrations

WILL PROVIDE THE TEACHERS WITH ADDITIONAL TRAINING IN THE TECHNIQUES OF VISUALIZING SCIENCE CONCEPTS AND PHENOMENA. HIGH SCHOOL STUDENTS WHO HAVE INDICATED A DESIRE TO BECOME TEACHERS WILL ALSO BE TRAINED TO CONDUCT THESE DEMONSTRATIONS, AND AS THE PROGRAM BECOMES ESTABLISHED AND ENLARGES WITH THE INCREASED ENROLLMENT, THESE STUDENTS WILL BE UTILIZED EVEN MORE. THIS PHASE OF THE PROGRAM SHOULD SERVE TO ENCOURAGE MORE STUDENTS TO SERIOUSLY CONSIDER THE TEACHING PROFESSION AS THEY CONTINUE THEIR PREPARATION FOR A CAREER.

AS THE RESULT OF EXPERIENCE WITH THESE DEMONSTRATIONS IN THE EARLIER STAGES OF THE ESTABLISHMENT OF THIS PROGRAM, KITS OF MATERIALS USED IN THE DEMONSTRATIONS WILL BE PREPARED. IN ADDITION TO CONTAINING MATERIALS BASIC TO THE DEMONSTRATION FOR WHICH IT IS PREPARED, EACH KIT WILL CONTAIN SOME INSTRUCTIONS FOR CONDUCTING THE DEMONSTRATION AS WELL AS SOME SUGGESTIONS FOR RELATED ACTIVITIES WHICH CAN BE CONDUCTED AS PART OF THE STUDY OF THE PARTICULAR SUBJECT. INCLUDED ALSO WILL BE SUGGESTIONS FOR STUDENT ACTIVITIES AND PROJECTS WHICH WILL ENCOURAGE FURTHER ACTIVITIES OF LEARNING ON THE PART OF THE INDIVIDUAL STUDENT. SELDOM IS THE INDIVIDUAL STUDENT ENCOURAGED TO UNDERTAKE INDEPENDENT LEARNING, AND THIS WILL BE AN OPPORTUNITY TO INSTIGATE THIS RESPONSIBILITY. THESE DEMONSTRATION KITS WILL NOT BE DESIGNED AS COMPLETE UNITS, BUT WILL ALLOW FOR THE DEVELOPMENT OF ACTIVITIES ON THE PART OF THE STUDENTS AND TEACHERS WHICH WILL RESULT IN SATISFACTORY UNITS OF STUDY IN THE VARIOUS FIELDS OF INTEREST.

WITH THE VAST AMOUNT OF FREE AND INEXPENSIVE MATERIALS AVAILABLE, ONE OF THE DUTIES OF THE SCIENCE SUPERVISOR WILL BE TO PROCURE, EVALUATE, AND COMPILE INFORMATION PERTINENT TO THE MATERIAL FOUND TO BE SUITABLE FOR CLASSROOM USE. A FILE OF CURRENT AVAILABLE MATERIAL WILL BE KEPT SO THAT THE TEACHERS MAY EXAMINE THE MATERIAL AND DECIDE UPON THAT TO BE USED. THE SUPERVISOR WILL ALSO ACT AS COORDINATOR FOR COMMUNITY RESOURCES WHICH MAY BE USED BY THE ELEMENTARY GROUPS. MUCH BETTER USE CAN BE MADE OF THE FILMS AND FILM-STRIPS IF THEY ARE PROPERLY USED AND IF THEY ARE NOT USED TO THE POINT OF MONOTANY. IN ADDITION TO MAKING AVAILABLE SUCH MATERIALS WITH WHICH MOST TEACHERS ARE NOT FAMILIAR, THE SUPERVISOR COULD AID IN SCHEDULING THE USE OF SUCH MATERIAL TO INSURE ITS MOST EFFECTIVE USE AND TO PREVENT OVERUSE. WITH THE INCREASED OFFERING OF EDUCATIONAL TELE-VISION IN THE AREA, MORE EFFECTIVE USE OF THIS RESOURCE COULD BE MADE THROUGH THE EFFORTS OF THE SUPERVISOR.

AS THE PROGRAM BECOMES ESTABLISHED, THE INDIVIDUAL TEACHER WILL ASSUME MORE OF THE RESPONSIBILITY OF CONDUCT-ING THE DEMONSTRATIONS USING THE KITS WHICH WILL BE MADE AVAILABLE FROM A CENTRAL COLLECTING POINT. THROUGH THE IN-SERVICE PROGRAM EACH TEACHER WILL AID IN THE DEVELOPMENT OF A COURSE OF STUDY IN SCIENCE FOR THE PARTICULAR GRADE TAUGHT, AND THE OVERALL CURRICULUM WILL BE CORRELATED TO SPECIFIC AIMS WHICH ARE TO BE ACHIEVED AS THE STUDENT PRO-GRESSES THROUGH THE ELEMENTARY GRADES. THIS COURSE OF STUDY WILL BE CONTINUALLY EVALUATED AND REVISED.

CONTINUING THROUGHOUT THE ESTABLISHMENT OF THE PROGRAM AND THEREAFTER, THE SUPERVISOR WILL AID THE ELEMENTARY GRADE TEACHER IN CONDUCTING GROUP PROJECTS WHICH WILL BE CONDUCIVE TO PROBLEM SOLVING. THE STUDENTS NEED TO BE SHOWN AT AN EARLY AGE THAT THROUGH READING, OBSERVATION AND QUESTIONING THEY MAY SEEK THE ANSWERS TO LIFE PROBLEMS. THIS PHASE OF THE PROGRAM WILL ALSO BE A FORM OF INSTRUCTION FOR THE TEACHER WHO HAS HAD LITTLE OR NO EXPERIENCE WITH THIS TYPE OF ACTIVITY.

WITH THE COMBINED EFFORTS OF ALL INVOLVED, A WELL BALANCED SCIENCE PROGRAM SHOULD BECOME AN INTEGRAL PART OF THE ELEMENTARY PROGRAM WITHIN A RELATIVELY SHORT TIME. SUCH A PROGRAM SHOULD PROVIDE THE STUDENT WITH THE BACKGROUND OF EXPERIENCE NEEDED IN THE FURTHER ACHIEVEMENT OF LEARNING.

CHAPTER III

THE INTERMEDIATE PROGRAM

THE PROPOSED INTERMEDIATE PROGRAM WILL BE AN ADVANCEMENT OF THE ELEMENTARY PROGRAM WITH SOME MODIFICATIONS AND ADDITIONS. BECAUSE OF THE ACTIVITIES, INTERESTS AND EXPERIENCES OF STUDENTS IN THESE GRADES BEING MUCH BROADER THAN IN THE LOWER GRADES, MORE FLEXIBILITY WILL BE EXERCISED IN DETERMINING THE ACTIVITIES TO BE UNDERTAKEN. THE TEACHERS OF THESE GRADES SHOULD BE ABLE TO MAKE MORE VERSITILE USE OF THE DEMONSTRATION KITS, AND THE STUDENTS IN THESE GRADES CAN BE VERY HELPFUL IN OBTAINING SOME OF THE MATERIALS THAT WILL BE NEEDED TO EQUIP THESE KITS. DESIGNING AND EQUIPING ONE OF THESE KITS COULD WELL BE A SUITABLE GROUP PROJECT FOR MEMBERS OF THESE GRADES.

THE SUPERVISOR WILL CONTINUE TO ACT IN AN ADVISORY CAPACITY IN THE USE OF AVAILABLE TEACHING MATERIALS, AND THE AMOUNT OF SUCH MATERIALS FOR USE BY THESE GROUPS IS MUCH GREATER THAN FOR THE YOUNGER GROUPS. SINCE MUCH MORE READING MATERIAL IS PUBLISHED FOR THIS GROUP, AN EFFORT WILL BE MADE TO OBTAIN THIS MATERIAL IN SUITABLE AMOUNTS AND TO ENCOURAGE A STRONG READING PROGRAM THROUGH THE SCIENCE ACTIVITIES OF THESE CLASSES.

SINCE THERE IS A TENDENCY FOR STUDENTS OF THIS AGE TO WANT TO BELONG TO A GROUP, THE SUPERVISOR WILL ASSIST IN ORGANIZING AND CONDUCTING THE ACTIVITIES OF SCIENCE CLUBS

COMPOSED OF MEMBERS OF THE VARIOUS GRADE LEVELS. SINCE THE ACTIVITIES OF THESE CLUBS WOULD NOT BE LIMITED TO CLASSROOM SITUATIONS, MUCH MORE EFFECTIVE USE CAN BE MADE OF SOME OF THE COMMUNITY RESOURCES. ACTIVITIES OF THESE CLUBS WILL GIVE INDIVIDUAL STUDENTS MORE OPPORTUNITIES FOR EXPLORATION INTO SCIENCE FIELDS AND WILL ALLOW FOR A MORE COMPLETE OBSERVATION OF STUDENTS SHOWING OUTSTANDING APTITUDES, INTERESTS AND ABILITIES. RECOGNITION OF GIFTED STUDENTS AT THIS LEVEL IS IMPORTANT TO THE MOST EFFICIENT ADVISEMENT OF THE STUDENTS AS THEY ENTER THE HIGH SCHOOL.

THROUGH CLASSROOM ACTIVITIES AND CLUB PARTICIPATION, STUDENTS WILL BE ENCOURAGED TO UNDERTAKE INDIVIDUAL PROJECTS AS WELL AS GROUP PROJECTS. THIS WILL PERMIT FURTHER OBSERVATION AND RECOGNITION OF TALENT. PROFESSIONAL PERSONS IN THE COMMUNITY WILL BE INVITED TO ACT AS ADVISORS IN THE COMPLETION OF THESE PROJECTS, THEREBY BRINGING THE STUDENTS IN CONTACT WITH SUCH PEOPLE AT AN EARLY AND IMPRESSIONABLE AGE.

ONE OF THE PURPOSES OF THE CLUB PROGRAM WILL BE TO PROVIDE THE STUDENTS IN THE UPPER ELEMENTARY GRADES WITH THE OPPORTUNITY TO BECOME MORE FAMILIAR WITH THE COURSE OFFERINGS IN THE HIGH SCHOOL, AND TO BECOME GENERALLY AWARE OF COLLEGE ENTRANCE REQUIREMENTS AND THE COURSES OF STUDY IN VARIOUS FIELDS OF SCIENCE. THE ULTIMATE GOAL OF THE INTERMEDIATE PROGRAM WILL BE TO FACILITATE THE TRANSITION OF THE AVERAGE AND ABOVE AVERAGE STUDENT INTO THE PROPER COURSE SEQUENCE AS HE ADVANCES THROUGH SCHOOL.

CHAPTER IV

THE HIGH SCHOOL PROGRAM

A GREAT PROPORTION OF THE GRADUATES OF THE SCHOOL ENDEAVOR TO ATTAIN SOME FORM OF HIGHER EDUCATION, EITHER VOCATIONAL, TECHNICAL OR PROFESSIONAL. THE DECISION TO PURSUE THIS HIGHER EDUCATION OFTEN COMES TOO LATE IN THE HIGH SCHOOL COURSE OF STUDY FOR THE STUDENT TO ADEQUATELY PREPARE FOR THE MOST EFFICIENT ATTAINMENT OF THE DESIRED EDUCATION. WITH TIME, THE PREVIOUSLY OUTLINED PROGRAM FOR THE LOWER GRADES WILL HELP TO OVERCOME THIS SITUATION. IN THE INTERIM THE COURSES NOW OFFERED IN MATH AND IN SCIENCE NEED TO BE CAREFULLY EVALUATED AS TO THE OUTCOMES AND VALUES TO THE STUDENTS. MOST STUDENTS ARE NOT REQUIRED TO ACCOMPLISH ACCORDING TO THEIR ABILITIES WITH THE RESULT THAT MANY OF THEM ENTER FIELDS OF HIGHER EDUCATION WITH A FALSE SENSE OF SECURITY AND ACCOMPLISHMENT WHICH OFTEN LEADS TO DIRE CIRCUMSTANCES.

THE STATE DEPARTMENT OF EDUCATION HAS RECENTLY REQUIRED ALL GRADUATING STUDENTS TO HAVE TWO CREDITS IN LABORATORY SCIENCE. AS A RESULT OF THIS REQUIREMENT, EVEN MORE STUDENTS WILL BE TAKING COURSES IN GENERAL SCIENCE AND GENERAL BIOLOGY. WITH THE WIDE RANGE OF INTERESTS AND ABILITIES AS WILL BE REPRESENTED IN SUCH CLASSES, THE CONTENT OF THESE COURSES WILL OF NECESSITY BE DIRECTED TOWARD THE AVERAGE AND BELOW AVERAGE STUDENTS. MORE CAREFUL EVALUATION SHOULD

BE MADE OF THE COURSE OFFERINGS AND REQUIREMENTS, AND CONSIDERATION SHOULD BE GIVEN TO THE NEEDS OF THE STUDENTS WITH ABILITIES AND INTERESTS THAT ARE AVERAGE AND ABOVE AVERAGE.

BECAUSE OF SEVERAL WEAKNESSES IN THE SCIENCE PROGRAM, IT IS NECESSARY TO SPEND MUCH TIME IN THE INTRODUCTION TO THE COURSES IN PHYSICS AND CHEMISTRY TO SUPPLY THE STUDENTS WITH THE NECESSARY SKILLS AND BACKGROUND WHICH THEY HAVE NOT ATTAINED BEFORE ENTERING THESE COURSES. WITH THE SCOPE OF EACH OF THESE COURSES INCREASING RAPIDLY, MORE TIME IS NEEDED IN ORDER TO SUPPLY THE AVERAGE STUDENT AS WELL AS THE ADVANCED STUDENT WITH THE EXPERIENCES THAT ARE NEEDED TO PREPARE FOR A FUTURE IN THESE FIELDS.

WITH THESE FACTS IN MIND, THE FOLLOWING PROPOSALS ARE MADE. WHILE THE STUDENTS ARE IN THE EIGHTH GRADE THEY WILL BE GIVEN INTEREST AND APTITUDE TESTS IN ADDITION TO MENTAL ABILITY TESTS. THE RESULTS OF THESE TESTS, ALONG WITH RECORDS OF ACHIEVEMENT, WILL SERVE AS AN INDICATION OF EACH STUDENT'S ABILITY. THOSE STUDENTS WITH ABILITY, INTEREST, AND SHOWING A DESIRE TO ENTER SOME FORM OF ADVANCED SCHOOLING AFTER HIGH SCHOOL GRADUATION WILL BE DIRECTED INTO THE PROFESSIONAL PREPARATORY PROGRAM. STUDENTS SELECTED FOR THIS PROGRAM WILL BE ENROLLED IN BIOLOGY RATHER THAN IN GENERAL SCIENCE IN THEIR FRESHMAN YEAR. THIS WILL BE THE SAME GENERAL COURSE IN BIOLOGY OFFERED TO OTHER STUDENTS IN THEIR SOPHOMORE YEAR, AND WILL BE A GENERAL INTRODUCTORY COURSE. IF THESE STUDENTS IN THE PREPARATORY PROGRAM PROVE

THEIR ABILITY, THEY WILL BE PERMITTED TO TAKE THE COURSE IN CHEMISTRY AS SOPHOMORES, AND IN THEIR JUNIOR YEAR AND SENIOR YEAR WILL CHOOSE BETWEEN SEVERAL COURSE OFFERINGS.

THOSE WHO PLAN TO GO INTO ENGINEERING OR ALLIED FIELDS OR WHO PLAN TO MAJOR IN PHYSICAL SCIENCE COULD TAKE PHYSICS AS JUNIORS AND THEN TAKE THE COURSE IN ADVANCED PHYSICAL SCIENCE AS SENIORS. THOSE STUDENTS WHO ARE INTERESTED IN CAREERS IN MEDICINE, MEDICAL TECHNOLOGY, BIOLOGY, AND RELATED FIELDS COULD TAKE THE COURSE IN ADVANCED LIFE SCIENCE IN EITHER THEIR JUNIOR OR SENIOR YEAR AND COULD TAKE PHYSICS IN THE OTHER YEAR.

THE ADVANCED PHYSICAL SCIENCE COURSE WOULD ALLOW MORE TIME FOR THE DEVELOPMENT OF FUNDAMENTAL CONCEPTS IN THESE SCIENCES. INCLUDED IN THE COURSE OF STUDY WOULD BE A MORE COMPLETE STUDY OF THE ATOMIC THEORY INTRODUCED IN THE PREVIOUS STUDIES. MORE ADVANCED CALCULATIONS THAN ARE UNDERTAKEN IN THE GENERAL COURSES WOULD PROVIDE EXPERIENCES IN APPLYING MATH AND LOGIC. AN INTRODUCTION TO NUCLEAR PHYSICS AND THE RELEASE OF NUCLEAR ENERGY WOULD BE PERTINENT TO BOTH PHASES OF STUDY. THE FUNDAMENTALS OF ELECTRICITY THAT ARE STUDIED IN GENERAL PHYSICS COULD BE ADVANCED INTO AN INTRODUCTION TO ELECTRONICS. THERE WOULD BE MANY TOPICS OF CURRENT AND INDIVIDUAL INTEREST THAT COULD BE EXPLORED AS PART OF CLASS ACTIVITY OR AS INDIVIDUAL PROJECTS. THE LABORATORY TIME COULD BE DEVOTED TO EXPERIMENTAL WORK RATHER THAN TO LABORATORY EXERCISES. THE EXPERIMENTS CARRIED ON WOULD BE OF THE TYPE TO WHICH IMMEDIATE ANSWERS COULD NOT

BE FOUND IN TEXT BOOKS, BUT WOULD INVOLVE THE OBSERVATIONS AND JUDGEMENT OF THE STUDENT IN DERIVING A SOLUTION TO THE PROBLEM UNDER CONSIDERATION. THIS COURSE WOULD ALSO PERMIT A MORE COMPLETE STUDY OF THE INDUSTRIAL PROCESSES WHICH ARE A PART OF THE ECONOMY OF THE AREA. AS THE RESULT OF THIS ADVANCED COURSE, THE STUDENTS SHOULD BE BETTER PREPARED TO ENTER INTO ADVANCED STUDY. FURTHERMORE THE CHANCES OF SUCCESS IN QUALIFYING FOR THE VARIOUS SCHOLARSHIPS SHOULD BE INCREASED. SINCE MANY OF THE COLLEGES ARE PERMITTING THE ADVANCED STUDENTS TO OMIT THE FIRST SEMESTER OF THOSE INTRODUCTORY COURSES IN WHICH THEY SHOW PROFICIENCY, THESE STUDENTS WILL BE BETTER QUALIFIED FOR SUCH CONSIDERATION.

THE ADVANCED LIFE SCIENCE COURSE WILL PROVIDE A MORE INTENSIVE STUDY OF THE VARIOUS FIELDS OF BIOLOGY, AND WILL ENDEAVOR TO RELATE THE STUDY OF BIOLOGY WITH THE STUDY OF ORGANIC CHEMISTRY AND APPLIED PHYSICAL SCIENCE. SUCH TOPICS AS GENETICS, PHYSIOLOGY, ENDOCRINOLOGY, AND ECOLOGY, WHICH ARE ONLY BRIEFLY STUDIED IN THE INTRODUCTORY BIOLOGY COURSE, COULD BE STUDIED IN MORE DETAIL IN THIS COURSE. BOTH OF THE ADVANCED COURSES WOULD PROVIDE EXPERIENCE IN LITERARY RESEARCH AND IN REPORT WRITING.

THERE ARE SEVERAL EXTRACURRICULAR ACTIVITIES WHICH COULD AUGMENT THE CLASSROOM ACTIVITIES. A PROJECT NIGHT, SCHEDULED FOR ALTERNATE WEEKS, WOULD PROVIDE ACCESS TO THE LABORATORY FACILITIES FOR THOSE STUDENTS WORKING ON INDIVIDUAL PROJECTS. THE ASSISTANCE OF PROFESSIONAL SCIENTISTS WOULD BE ENCOURAGED. MANY OF THESE PEOPLE, REPRESENTING A

WIDE SCOPE OF ENDEAVOR, LIVE IN THE AREA AND HAVE INDICATED A WILLINGNESS TO ASSIST IN SUCH A PROGRAM. THIS CONTACT WITH PROFESSIONAL PEOPLE SHOULD PROVIDE THE STUDENTS WITH ADDED INSIGHTS AND EXPERIENCES IN THE FIELDS OF THEIR INTERESTS. THESE ADVISORS WOULD BE AWARE OF RECENT DEVELOPMENTS IN THEIR PARTICULAR FIELDS AND WOULD HAVE ACCESS TO INFORMATION WHICH WOULD NOT BE AVAILABLE IN CURRENT LITERATURE. WHILE CONTRIBUTING TO THIS PROGRAM, THESE PROFESSIONAL SCIENTISTS WILL BECOME MORE AWARE OF THE OFFERINGS AND PROBLEMS OF THE SCHOOL AND CAN BE INSTRUMENTAL IN OVERCOMING SOME OF THESE PROBLEMS.

ONE NIGHT A MONTH WILL BE KNOWN AS CAREER NIGHT. THE PROGRAMS PRESENTED ON THESE NIGHTS WILL SERVE TO ACQUAINT THE STUDENTS WITH THE REQUIREMENTS AND OFFERINGS OF THE VARIOUS SCIENTIFIC VOCATIONS. PROFESSIONAL ORGANIZATIONS AND INDIVIDUALS WILL BE CALLED UPON TO CONDUCT MANY OF THE PROGRAMS, THUS PROVIDING THE STUDENTS WITH INCREASED OPPORTUNITIES TO GAIN FIRST-HAND INFORMATION CONCERNING THE MANY FIELDS OF OCCUPATIONAL AND PROFESSIONAL SCIENCE. STUDENTS NEED TO BE MADE MORE AWARE OF THE REQUIREMENTS OF OCCUPATIONS AND PROFESSIONS EARLY IN THEIR HIGH SCHOOL STUDY, AND THIS PROGRAM IS ONE POSSIBLE SOLUTION TO THE NEED.

THE ORGANIZATION AND PURPOSE OF THE JUNIOR ACADEMY OF SCIENCE WILL BE REVISED, NOT ONLY TO ENCOURAGE ACHIEVEMENT, BUT TO PROVIDE FOR THE RECOGNITION OF ITS ATTAINMENT. THE JUNIOR ACADEMY IS SPONSORED BY THE TEXAS ACADEMY OF SCIENCE WHICH HAS A FUND TO PROVIDE FINANCIAL AID IN INDIVIDUAL PRO-

JECTS, AND ALSO PROVIDES FOR THE RECOGNITION OF OUTSTANDING ACCOMPLISHMENTS OF STUDENTS. SINCE THERE WILL BE A GENERAL SCIENCE CLUB AS PART OF THE REGULAR EXTRACURRICULAR PROGRAM OF THE HIGH SCHOOL, MEMBERSHIP IN THE JUNIOR ACADEMY OF SCIENCE WILL BE LIMITED TO THOSE STUDENTS SUCCESSFULLY PURSUING THE PROFESSIONAL PREPARATORY PROGRAM ON THE JUNIOR OR SENIOR LEVEL.

THE ULTIMATE GOAL OF THE HIGH SCHOOL PROGRAM IS TO PROVIDE ALL STUDENTS WITH THE OPPORTUNITY TO SECURE A GENERAL BACKGROUND IN THE VARIOUS FIELDS OF SCIENCE AND TO PROVIDE EXTENDED OPPORTUNITIES TO THOSE STUDENTS SHOWING INTEREST AND ABILITY.

CHAPTER V

THE SUMMER PROGRAM

There are many phases of science education that cannot be dealt with adequately within the confines of the classroom and the time limits imposed there. The proposed summer program will be a continuation of the science activities begun in the regular school year and will provide for a carry-over of such activities so that interest will not be lost. The program will provide for many activities not easily fitted into the school schedule.

The elementary phase of the program will be exploratory. The activities will be coordinated with the summer recreation program and will take place on one morning of each week. Demonstrations, viewing selected films, nature hikes, collecting materials and specimens, sessions for the reading and telling of stories of science events and people, and field trips will make up the activities of this group. There are many places within a short distance which will be very interesting places to visit on field trips. Included among these would be dairies, bakeries, airports, seaports, and the like. To make the most extensive use of such experiences, activities which lead up to the visit will be planned and utilized. Demonstrations, films, story session activities and other explanations will make the visit more meaningful than if the visit were to be made without this

previous consideration, Parents will be invited to take part in these activities.

The intermediate program will include activities that are more basic and advanced than those used with the elementary group. Individual collections and projects will be encouraged. Provision will be made for a summer reading program which will encourage the reading of books and other material related to science and scientists. The field excursions, with the related activities which lead up to the visit, would include such places of interest as television and radio studios and stations, industries, construction sites, power plants, and other places of interest in the vicinity. The activities of this group will provide an excellent opportunity to observe students in the upper intermediate grades and to permit individual attention to those students showing interest and aptitude in science.

Activities in the high school program would be scheduled at night, for the most part, since many of the students are employed during the day. The Project and Career Night activities of the regular school year would be continued and opportunities for students to visit and explore industrial and other interesting organizational facilities would be provided. This phase of the program could prove to be very instructive, since many of the industries in the area have expressed a desire to help students to become familiar with processes, policies, and employment requirements. This activity should help students in selecting a career.

To enrich the offerings of this summer program, short courses in various fields of interest could be offered. Among topics that might be covered in such courses would be industrial processes, health, water conservation, current developments, and many others which would be of interest to students in general. Perhaps adults in the community would choose to take part in the activities of such courses, and certainly local authorities would be used as resource and advisory people. Included in these short courses might be some training courses for elementary and intermediate grade teachers as well as orientation courses for teachers in the other fields who might profit by becoming better acquainted with some of the various topics of current interest.

With the increased emphasis and dependence upon the various fields of science, it will become more and more the responsibility of the school to not only educate youth, but to add to the knowledge of the adults in the community as well. The summer program outlined here might well be the beginning of such a program. More complete and continual use will be made of the school facilities which represent a large investment of public funds.

CHAPTER VI

ESTABLISHMENT OF THE PROGRAM

If the program as outlined is approved by the Administration and the Board of Education, some steps in the establishment of the program will need immediate attention so that the institution of the program can be facilitated as soon as possible with the minimum of conflict. Many of the circumstances cannot be anticipated, but there is a certain amount of flexibility in the program which may aid in overcoming most of these variable conditions.

So as to establish the proper sequence of courses in the preparatory program, students now in the eighth grade who show aptitude and ability as well as interest will be advised to enroll in Biology at the time of spring registration. Members of this class will then be able to follow the prescribed sequence of courses through their remaining four years of school, taking Chemistry as sophomores, then Physics followed by Advanced Physical Science if their interests are mainly in the physical sciences, or taking the Advanced Life Science course and Physics if their interest is more in the life sciences. The supervisor will contact each of these students and their parents during the summer months to make certain that they understand the program.

Students who will be sophomores during the next school year and who have the qualifications for the preparatory

PROGRAM WILL BE ADVISED TO TAKE EITHER CHEMISTRY OR BIOLOGY NEXT YEAR, DEPENDING UPON THEIR INTERESTS AND ABILITIES. THOSE INTERESTED IN THE LIFE SCIENCES COULD TAKE BIOLOGY FOLLOWED BY CHEMISTRY SO THAT THEY COULD TAKE THE ADVANCED LIFE SCIENCE COURSE IN THEIR SENIOR YEAR. FOR THOSE STUDENTS INTERESTED IN THE PHYSICAL SCIENCES, THE LOGICAL ORDER OF COURSES WOULD BE CHEMISTRY, THEN PHYSICS, WITH THE ADVANCED PHYSICAL SCIENCE TAKEN IN THE SENIOR YEAR. THESE LATTER STUDENTS WOULD NOT HAVE A FORMAL COURSE IN BIOLOGY, BUT AT THE PRESENT TIME THE BIOLOGICAL CONTENT OF THE GENERAL SCIENCE COURSE IS SUFFICIENT TO GIVE THESE STUDENTS A GENERAL BACKGROUND IN THE SUBJECT. FURTHER, IT IS ANTICIPATED THAT IN THE FIRST TWO YEARS OF THE PROGRAM THE CONTENT OF THE ADVANCED COURSE WILL POSSIBLY BE MODIFIED TO INCLUDE SOME ADVANCED BIOLOGICAL SCIENCE TO MEET THE NEEDS AND INTERESTS OF MORE OF THE STUDENTS.

PERHAPS DURING THESE FIRST TWO YEARS A BETTER NAME FOR THE COURSE WOULD BE ADVANCED SCIENCE BECAUSE THE COURSE CONTENT WILL BE GOVERNED BY THE PREVIOUS EXPERIENCES OF THOSE STUDENTS ENROLLED IN THE COURSE. THE STUDENTS WHO WILL BE TAKING THE COURSE DURING THE FIRST YEAR OF THE PROGRAM WILL HAVE HAD COURSES IN GENERAL SCIENCE, BIOLOGY, AND PERHAPS CHEMISTRY AND WILL BE TAKING PHYSICS OR CHEMISTRY SIMULTANEOUSLY. BECAUSE THESE STUDENTS WOULD HAVE ONLY THIS ONE OPPORTUNITY TO TAKE THE ADVANCED COURSE, IT IS LOGICAL THAT THE COURSE OF STUDY INCLUDE SOME BIOLOGICAL TOPICS. SOME TIME WILL BE NEEDED BEFORE THOSE STUDENTS TAKING PHYSICS

WILL HAVE GAINED EXPERIENCE IN PROBLEM SOLVING AND PHYSICAL CONCEPTS TO BE PREPARED FOR THE PHYSICAL SCIENCE TOPICS OF THE COURSE, AND THIS TIME COULD BE WELL UTILIZED BY GIVING THE STUDENTS AN ORGANIZED OVERVIEW OF THE LIFE SCIENCE.

THOSE STUDENTS WHO WILL BE JUNIORS NEXT YEAR WILL HAVE HAD LITTLE MORE OPPORTUNITY TO PREPARE FOR THE ADVANCED COURSE TO BE TAKEN IN THEIR SENIOR YEAR, SO THE COURSE FOR THE SECOND YEAR WILL OFFER MUCH THE SAME MATERIAL AS FOR THE FIRST YEAR. THESE FIRST TWO YEARS WILL ALLOW FOR CONSTANT EVALUATION OF THE TOPICS THAT MIGHT BE INCLUDED IN THE ADVANCED COURSES WHEN THEY WILL BE TAUGHT SEPARATELY IN THE THIRD YEAR OF THE PROGRAM. DURING THE FIRST TWO YEARS THAT THIS COURSE IS TAUGHT THERE WILL BE CERTAIN UNAVOIDABLE CIRCUMSTANCES TO BE CONSIDERED, BUT WITH THE PURPOSE OF PREPARING THESE STUDENTS FOR COLLEGE ENTRANCE THE COURSE SHOULD BE MOST WORTHWHILE EVEN UNDER THESE CONDITIONS, AND THE ADDITIONAL EFFORT SHOULD BE JUSTIFIED.

SINCE THERE ARE NO TEXT BOOKS PUBLISHED WHICH WOULD BE COMPLETELY SUITABLE FOR THE MATERIAL TO BE COVERED IN THIS ADVANCED COURSE, MUCH OF THE MATERIAL USED WILL HAVE TO BE COMPILED FROM VARIOUS SOURCES AND THEN DUPLICATED. THIS WILL BE ONE OF THE MAJOR ACTIVITIES OF THE SUPERVISOR DURING THE FIRST SUMMER OF THE PROGRAM. THE ACQUISITION OF SUFFICIENT AND APPROPRIATE REFERENCE BOOKS WILL BE UNDERTAKEN DURING THE SAME TIME AND THIS PROJECT WILL BE CONTINUED THROUGH THE ACTIVITIES OF THE JUNIOR ACADEMY OF SCIENCE AS ONE OF THE PROJECTS OF THAT ORGANIZATION.

THE LABORATORY EXPERIENCES WILL BE PLANNED TO PROVIDE THE STUDENTS WITH THE OPPORTUNITIES ASSOCIATED WITH TRUE EXPERIMENTATION. ALL OF THE EXPERIMENTS PERFORMED WILL BE OF THE TYPE TO WHICH IMMEDIATE SOLUTIONS ARE NOT OBVIOUS. THE STUDENT WILL BE REQUIRED TO MAKE CAREFUL OBSERVATIONS AND COMPUTATIONS AND TO INTERPRET THESE ON THE BASIS OF CONCEPTS AND PRINCIPLES WITH WHICH HE IS FAMILIAR. PRECISE AND COMPLETE REPORTS WILL BE REQUIRED SO THAT THE STUDENTS MAY DEVELOP SKILL IN THE METHODS OF REPORT WRITING. PROVISIONS WILL ALSO BE MADE FOR INDIVIDUAL EXPERIMENTATION, THOUGH THIS ACTIVITY WILL BE CLOSELY SUPERVISED TO AVOID SAFETY HAZARDS.

THE CAREER NIGHT PROGRAMS WILL BE OUTLINED AND SCHEDULED BY THE SUPERVISOR DURING THE SUMMER AND THE INDIVIDUALS AND ORGANIZATIONS WILL BE CONTACTED AND ASKED TO SUPPLY THE PERSONNEL WHO WILL MAKE THIS ACTIVITY THE TYPE OF EXPERIENCE NEEDED BY THE STUDENTS.

IF STUDENT INTEREST WARRANTS SUCH, THE PROJECT NIGHT PROGRAM COULD BE STARTED THIS SUMMER. THE CURRENT INTEREST IN SCIENCE FAIRS AND SCHOLARSHIP COMPETITION SHOULD PROVIDE THE STIMULUS FOR SUCH AN ACTIVITY.

THE SUPERVISOR WILL SPEND MUCH TIME IN EXAMINING THE AVAILABLE BOOKS USED IN ELEMENTARY SCIENCE AND IN CONFERING WITH ELEMENTARY TEACHERS IN PLANNING THE TYPES OF DEMONSTRATIONS TO BE INCLUDED IN THE PROGRAM FOR THE YEAR. THE ASSEMBLING OF THE KITS OF MATERIALS WILL BE A CONTINUING ACTIVITY TO BEGIN THIS SUMMER.

Because of the vast amount of planning and preparation required to initiate the program during the coming year, no attempt will be made to conduct the summer program as outlined. Plans for this program to be conducted during the following summer will be made during the school year so that the announcement of the schedule of activities can be made well in advance of the closing of school in the spring.

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