A COMPARATIVE STUDY OF THE PERFORMANCE OF STUDENTS MAJORING IN INDUSTRIAL ARTS, ENGLISH, SOCIAL SCIENCE, SPEECH, ART, AND HOME ECONOMICS AT THE KANSAS STATE TEACHERS COLLEGE OF EMPORIA

A Thesis

Presented to

the Faculty of the Department of Industrial Arts

and the Graduate Council

Kansas State Teachers College of Emporia

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

---

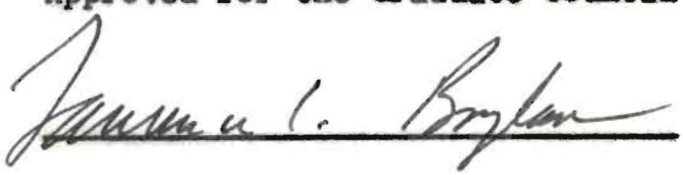
by

Arland L. Grover

May 1962

Approved for the Major Department

Approved for the Graduate Council



ACKNOWLEDGMENT

The writer wishes to express his sincere appreciation to Dr. E. L. Barnhart, for his assistance and direction in the preparation of this thesis.

TABLE OF CONTENTS

LIST OF TABLES

TABLE PAGE

TABLE PAGE

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The aims, objectives and purposes of the public schools in America have for the past few years been criticized by a wide diversity of individuals. One criticism charged that educators, in their efforts to relate education to the lives of the students, have divided the curriculum and dissipated their energies on peripheral detail or trivial matters. The critics said that academic (meaning verbal) subjects should be offered to the exclusion of superficial subjects such as home economics, industrial arts and driver education.[1] These critics viewed industrial arts and other similar non-verbal subjects simply as means of developing technical skills and they felt that they were in no sense intellectual disciplines. They indicated that these subjects were for the less intellectual or less academically inclined students and that the training of these persons was not the responsibility of the public schools. What the critics indicated defined the function of the public school in much narrower terms than that which has been generally accepted in America. It also assigned a

---

[1]Sterling M. McMurrin, "A Crisis of Conscience," The Saturday Review, September 16, 1961, pp. 59-60.

different level of respectability, acceptance, and intelligence to the student of non-verbal subjects than that assigned to the students of the verbal subjects.

These critics would develop curricula and set goals with little reference to the variety of needs and abilities of students. Objectives and curriculums should be based on the co-ordinated judgment of those qualified by experience and background.[2] Most qualified educators agree that among any group of students there will be a great variety of skills, abilities and other qualities. The idea that this great variety of qualities can be measured by a single I Q test is receiving less and less acceptance. Intelligence is based upon both verbal and non-verbal factors. Also most school subjects can be divided into the highly verbal subjects and those subjects requiring less verbal ability. If verbal facility is the only objective of the public schools then the critics mentioned above are right, but the very nature of our economy demands that we also teach the non-verbal subjects. Are we interested in educating students to achieve only a few of the objectives or all of the objectives that will support our economy and our democracy? Are we interested in educating a few of our youth or all of our youth?

---

[2]J. W. Buchta, "A Congress on Education," School and Society, 87:417-18, October 24, 1959.

This investigator takes the side of those who would have education serve the total needs of our industrial economy and renowned democracy and at the same time meet the variety of needs exhibited by students. The investigator is a proponent of industrial arts in the public school curriculum and is concerned with the criticism which has been leveled at it recently. Because of unfavorable criticism, some lay people and some professional educators look upon industrial arts as a subject for the non-academic, lower intelligence students.[3] This implies lower prestige, social status, intellectual attainment, and academic respectability for the student of industrial arts.

Since the early part of the century when industrial arts was introduced into the curriculum of the public schools it has been considered a general education course. Its objective has been to contribute to the understanding of the industrial and technical aspects of life today as well as to contribute to occupational development. As a general education course it is a commonly accepted fact that industrial arts should be offered to all pupils at the junior high school level on an exploratory basis to help pupils determine their interests and aptitudes. It is

---

[3]AIAA Research Committee, "Research Report," The Industrial Arts Teacher, Vol. XVIII, No. 3, January-February, 1959, p. 19.

essential for youth to understand their capacities and abilities if they are to make an educational or occupational gain in our complex world.

On the senior high school level, while industrial arts remains a part of the general education program, it is logically offered as an elective. At this level it should be elected by some students who are preparing for programs such as engineering, science, and industrial management. However, for the most part we would expect it to be elected by those students who are likely to pursue a vocational program. It is reasonable to assume that there would be a wide range of abilities among those taking the course at the senior high school level. It is also likely that among these students there would be individuals who are high in verbal ability as well as high in mechanical ability. It is these students who are needed on the college level to be trained as industrial arts teachers. It is obvious that the person studying to be an industrial arts teacher should have, in addition to manual dexterity, as much verbal ability as any other person who is training to be a teacher. Because of the criticism of industrial arts today and the attitude of certain people, it is possible that these more gifted persons, the ones needed to carry out all of the industrial arts objectives, are avoiding the college industrial arts teacher training program.

This study was undertaken to investigate one facet of this situation. It is an effort to determine if persons who have graduated from the Kansas State Teachers College with a major in industrial arts were approximately equal in verbal ability (as measured by entrance tests) to other graduates; and to determine whether industrial arts graduates achieved in college on a level approximately equal to those students graduating with majors in English, speech, social science, home economics, and art.

I. THE PROBLEM

Statement of the problem. The purpose of this study was to compare the achievement of industrial arts majors at the Kansas State Teachers College with majors in English, speech, social science, art and home economics in the following respects: (1) College grades received in the major areas of study; (2) College grades achieved in courses outside the fields of major emphasis; (3) Scores received on entrance examinations.

Hypotheses. The hypotheses for this study are: (1) The industrial arts students as a group are composed of approximately the same percentage of students from the upper and lower decile rankings (as measured by college entrance examinations) as are the groups of students in the

other areas of study mentioned above; (2) The industrial arts students will achieve grades approximately equal to students in other areas of study.

Source of data. The data for this study were taken from records maintained in the office of Records and Admissions and in the Bureau of Tests and Measurements at the Kansas State Teachers College of Emporia.

Description of the study group. The study group was composed of 290 graduates for the years 1951 through 1960 inclusive. These graduates were majors with a minimum of thirty hours in either industrial arts, home economics, art, English, speech or social science. Only graduates with more than thirty hours in their major were considered because of the difficulty of assigning double majors to a specific category. Only graduates who completed a minimum of ninety semester hours of their work at Kansas State Teachers College were considered because of the difficulty of assessing the value of grades received at other institutions.

Importance of the study. Because of beliefs dating back at least as far as the beginning of this nation, the public educational system organized in this country was theoretically designed to provide an education for all. Industrial arts, since it offers an opportunity for the

expression of interests and abilities not provided for by other areas of study, assists in meeting this goal. It helps many students utilize innate capacities in such a way that they may more fully take advantage of the many activities available in our present day culture. However, fulfillment of all of the industrial arts aims and objectives is possible only if the classes are taught by persons possessing both verbal ability and manual dexterity. Therefore, it is essential that the individuals responsible for training these teachers know as much as possible about the quality of the persons going out to instruct in industrial arts. The statistical data provided by this study was an attempt to show what caliber of persons were graduated as thirty hour industrial arts majors from 1951 through 1960.

Current statistics reveal an ever-increasing enrollment in the American schools. The number of problems facing educators has kept pace with increased enrollments. One of the problems is that of development of curricula to meet the expanded needs of this increased enrollment in such a manner that both the individual and society will be best served. Because of adverse criticism, many curriculums have been altered so that they serve only the verbally inclined, rather than all persons in the society. This ignores the fact that education has two purposes; improvement

of the society and development of the individual. Our present curriculum should be so developed that it would stress neither of these goals over the other. Only if good industrial arts programs are carried out in the public schools will the society and the individual be best served and adverse criticism reduced. Good industrial arts programs are possible only if well qualified teachers are being produced by the college training program; therefore those responsible for this training need information relative to qualifications and achievement of their graduates.

It has been said that life cannot be lived to the fullest nor government run efficiently unless education, the basis of any society, provides the means to cope with the increasing complexity of the problems facing today's citizen. Evaluation of public education, therefore, is important if we are to know whether educators are keeping abreast of their responsibilities.

It is important to the individual and to society for the student to prepare himself so that he can contribute the most to himself and to society. Therefore, the statistical inferences and information derived from this study should also be of value to those whose responsibility it is to plan public school objectives and to counsel the student concerning his likelihood of success in certain

areas of endeavor. If the evaluation of the industrial arts graduates' records have some significance, however small, the information should play a part in the total educative program.

II. DEFINITION OF TERMS USED

Decile. A decile is one of nine points that divide a ranked distribution into ten parts, each containing one-tenth of all cases. For the purposes of this paper it is especially a ranking of the ability represented by the scores received on the Schrammel general ability test taken by entering students at the Kansas State Teachers College of Emporia.

Decile rank. Decile rank is the rank order of the ten divisions created by the deciles. Thus the first decile rank is the rank of those below the first decile point.

GPA. This is an abbreviation for the term grade-point average. At the Kansas State Teachers College it is based upon the following four-point system: A = 4 points, B = 3 points, C = 2 points, and D = 1 point.

Majors. For the purpose of this study this term refers to those pupils who had, upon graduating, a minimum of thirty semester hours of study in their selected field of emphasis.

CHAPTER II

REVIEW OF THE LITERATURE

The review of literature given in this chapter is divided into three parts: (1) a review of criticisms directed toward education; (2) a review of literature on evaluation in general; (3) a review of comparative achievement studies. These comparative achievement studies were reviewed with two points in mind: (1) to review subjects similar to this study of the achievement of industrial arts students and (2) to review studies of similar procedures.

Much has been written in recent years in regard to the American public educational system, its curriculum, and purpose. Much has also been written in regard to the subject of evaluation in general but only a limited number of comparative achievement studies were located by the investigator.

The authors of the section on industrial arts in the Encyclopedia of Educational Research stated that industrial arts is a relatively new curriculum in general education with most of its development having occurred within the past fifty years.[1] The opportunity to develop and organize the

---

[1] "Industrial Arts," Encyclopedia of Educational Research (3rd ed.) p. 688.

industrial arts curriculum during the past fifty years was disrupted by two great wars and a severe depression. As a result of this brief and broken period of development there has been only a modest amount of research and professional literature published in the field.

CRITICISM AND DEFENSE OF THE INDUSTRIAL ARTS PROGRAM

From the review of literature written in criticism of, and in defense of, the educational system in general, and the industrial arts program in particular, it is likely that much of the public has been lead to believe we have been following a poor system. Criticism of the educational system of this nation and others is not new. Gabriel Ofiesh[2] stated that schools and education have always been a convenient scapegoat for the inadequacies of responsible parents and statesmen. He pointed out that Aristotle in Athens about 300 B. C. said: "There are doubts concerning the business of education since all people do not agree on those things which should be taught." Ofiesh said that what is needed above all else in education today is balance and perspective.

---

[2]Gabriel D. Ofiesh, "Balance and Perspective in Education," Vital Speeches of The Day, Vol. XXIV, No. 11 (March 15, 1958), p. 342.

He also stated that at various times during the past few years reactionary voices have been raised against the "new" education and raised in praise of the "old" education. "However," said Ofiesh, "without false pride it is possible to say that education is greatly responsible for America being what it is."[3] Among other things there has been developed a common concern for the welfare of human beings and the dignity of each individual.

He further proclaimed that in spite of what critics have said about American youth receiving a poor education, the youth of today faces a much more difficult curriculum than any utilized before.

He also stated that the educational ideal is being much more nearly met in today's schools. About seventy-five per cent of our youth attend high school today whereas only about ten per cent attended high school forty years ago. At least they are getting some education! A drastic overhaul of our educational system is not needed. Even today it is being copied in some aspects by Russia and many other countries of the world.

The past half century of education has witnessed many changes. While there have been mistakes, the evidence is clear that the modern school has assumed broadened

---

[3] Ibid., p. 343.

responsibilities with a diversified program without neglecting the time-honored job of teaching the fundamentals. Despite occasional attacks by irresponsible individuals and groups, the schools have profited by criticisms from reliable sources both within and without their own professional ranks. The result has been an educational enterprise of and for all members of society--not just for a few.

What is the purpose of education then as it applies to our society? In a democracy it is to provide for cultural and vocational development--citizenship. Thus the educational purpose is two-fold; it attempts to aid both society and the individual.

Most of the criticism directed at the educational system in recent years has been concerned with the lack of stress placed on the purely academic subjects. These critics advocated that schools should stress intellectual goals, with learning derived primarily from books. Many of these critics further advocated that certain subjects, including industrial arts, be relegated to a minor role or left out of the curriculum entirely. They maintained that industrial arts fosters only development of motor skills, not intellectual development.

As a result of this mass of criticism the American public has devalued the industrial arts program as a part of the school curriculum. In a technical research report

submitted to the United States Office of Education,[4] it was reported that the teaching of industrial arts and the providing of funds for vocational education was one of the least important tasks of the schools, as seen by the public. However, the same article pointed out that the public's extent of knowledge about schools and their purpose was very slight.

One of the foremost critics of our educational system has been Admiral H. G. Rickover. Rickover said that "trivial, recreational, and vocational subjects, alleged to be of more practical value, have been substituted for the more useful academic subjects in American elementary and high schools."[5] He advocated a strict adherence to the "hard" core subjects of education.

Hornbake,[6] addressing the Ontario Industrial Arts Association in 1958, said that no one can lay a rightful claim to being an educated person today unless he has come to understand some of the components of an

---

[4]Institute for Communication Research, "Voters and Their Schools," National Education Association Journal, March, 1961, p. 29.

[5]Admiral H. G. Rickover, "European and American Secondary Schools," Vital Speeches of The Day, Vol. XXIV No. 22 (September 1, 1958), p. 698.

[6]R. Lee Hornbake, "Professional Growth In Industrial Arts Education," The Industrial Arts Teacher, Vol. XIX, No. 2 (November-December, 1959), p. 14.

industrial society. He went on to say that it is the function of industrial arts instruction to furnish this understanding and help fulfill the school's social responsibility of helping the children understand the world in which they live.

Supporting Rickover's viewpoint was (among others) Clifton Fadiman. He took the position that if man is rational, a basic education in academic subjects is needed. He said that if man is not rational but essentially animal then a wide range of electives such as home economics, industrial arts and other social and vocational courses becomes essential. He stated that certain subjects have generative powers and others do not and all but the "academic" subjects should be jettisoned.[7]

Along this same line of reasoning were statements made by Grayson Kirk, President of Columbia University. He said that high school curriculums should be centered around a core of subjects including mathematics, foreign language, English and science and that other subjects which make a hodgepodge of trivia should be eliminated.[8]

---

[7]Clifton Fadiman, "Roots of The School Dilemma," The Saturday Review, 42:14, September 12, 1959.

[8]Grayson Kirk, "Education For The Future," Vital Speeches of The Day, Vol. XXV, No. 4 (December 1, 1958), p. 120.

However, another educator, J. F. Fischer,[9] stated that to charge the school with nothing but the intellectual development of its pupils is psychologically impossible and morally irresponsible since the human mind can be developed only through contact with other minds, thus making the social dimension ever present.

Another outspoken critic of our educational system has been Arthur Bestor, Professor of the University of Chicago. He stated that it was his contention that professional educationalists have redefined the purposes of the schools in terms that are almost completely non-intellectual. He said that our public schools are preparing youth for a dream world and that the practical training they are providing is not education because it lacks educational content.[10] He also proclaimed that the American educational system is providing a watered-down curriculum with many "frill" courses being offered, among which he included industrial arts. He stated that American public schools cannot carry on the miscellany of activities assigned to it and at the same time provide quality, basic intellectual

---

[9]John H. Fischer, "Effective Modern Education As The Educator Sees It," National Education Association Journal, 48:16, March, 1959.

[10]Arthur Bestor, "A Crisis of Purpose," Vital Speeches of The Day, Vol. XXIV, No. 23 (September 15, 1958), p. 723.

training. Bestor averred that there are statistics which show that American public schools, taken as a whole, have failed to provide this quality education.[11]

On the other hand, supporting the curriculum was Charles W. Ferguson[12] who pointed out that a philosophy which espouses the education of a few rather than the education of the whole is inconsonant with the democratic system. He stated that the notion that everybody may and can become educated to a degree is a new one in the history of the human race and that it is being carried out more satisfactorily in America than anywhere else in the world.

Yet another critic of the industrial arts program has been Dr. James B. Conant.[13] He pointed out that not all children could master the "academic" subjects to a practical degree. No one, he said, would consider requiring all boys and girls, irrespective of their talent, to play a musical instrument, yet recent proposals to the school curriculum have been equally absurd. Provision should be made for development of manual skills and the

---

[11] Ibid., p. 725.

[12] Charles W. Ferguson, "Excellence For What?" National Parent Teacher Magazine, 55:7, September, 1960.

[13] James B. Conant, "The Prestige Image and Industrial Education," Industrial Arts and Vocational Education, January, 1961, p. 15.

needs of the less academically inclined. He went on to say that in the high school vocational education and industrial arts should not be offered in lieu of academic subjects but should grow out of the academic subjects and be offered in a separate program, taught by men from industry with industrial arts, as such, replaced by strictly vocational courses.

Joseph Justman[14] stated that shop courses are not courses for the slow learners. He stated that it takes as much "brainpower" to study courses such as electronics as it does to study Greek. The needs of all our youth, he said, cannot be served by placing undue stress on either the verbal or the non-verbal subjects.

The review of literature presented here in regard to the criticism of industrial arts is but a small part of that which has been published in recent years. It is evident that the sum total of this critical literature has placed the industrial arts program in an unenviable light as far as the public is concerned. It is also evident that much of the criticism has come from persons who admittedly do not understand the industrial arts program and its objectives as a general education course. Too, it is evident that most

---

[14]Joseph Justman, "The School and the Intellectual," The Educational Forum, Vol. XXV, No. 1 (November, 1960), p. 31.

proposed alternatives for the present program offered by the American educational system would meet the needs of only a few of the youth.

There was support for the present educational system (with a few minor revisions) from those who insisted that education must take into account the student's emotions, physical and aesthetic needs, and vocational aspirations as well as his intellectual development.

It has been said that the school system reflects the kind of society that gives it support. What then is the purpose of education as it applies to our society? The ultimate purpose of education in a democratic society is to provide for cultural and vocational development, or generally speaking, citizenship. Certainly the schools should be concerned with intellect, but there should also be other goals such as development of character and other talents.

Lawrence G. Derthick, United States Commissioner of Education, said, in a hearing before the House of Representatives, that there are different kinds of abilities; abstract, artistic, mechanical and social. American schools, he said, are concerned with all youth and need to provide for these various abilities. Much talent is ignored and

wasted in a school which follows the idea that knowledge in verbal subjects is the only important goal.[15]

If the American school system is to meet its moral, social, and individual obligations, planning for education should be firmly rooted in our own traditions and extended in terms of our deeply cherished values and aspirations.

EVALUATION

From a consideration of the work which has been done in evaluating the effectiveness of educational institutions, it is evident that there exists a need for more endeavor along this line. There exists a need for further study that curriculums may be provided which adequately meet pupil needs as the world undergoes continual permutation.

It should be pointed out that the following pages do not contain a complete review of the literature on evaluation. The topic of evaluation is a broad one with numerous ramifications, and as noted in the limitations previously listed, this study is concerned with only one phase of evaluation--that of academic comparison of student grades within selected major areas of study.

---

[15]United States Congress, House of Representatives, Committee on Appropriations, Review of The American Educational System, Hearings before Subcommittee, 86d Congress, 2d Session, February 3, 1960 (Washington: Government Printing Office, 1960), p. 8.

In education as in other fields of endeavor, goals are set. The educational program provides the pathway for attaining these goals. Therefore, just as a merchant takes inventory to discover his loss, so should the educator evaluate the results of teaching. The merchant analyzes the inventory to determine his sales program and customer desires. The educator should analyze to see if pupil needs are being fulfilled, or if improvements are necessary. However, Ahmann and Glock said that evaluation is more difficult for the educator than for the merchant because of the myriad factors that cause each person to be an individual.[16] Nevertheless, evaluation, even though the instruments of measurement are less accurate in education than in business, helps the teacher to determine the degree to which educational objectives have been achieved.

According to a study by Ernest Melby, evaluation has been subjected to many false starts and errors.[17] In spite of the confusion surrounding the problem of evaluation, the studies that have been conducted have helped to clarify many issues so that a more rapid and solid progress in curriculum development has been possible. He said that without proper

---

[16] J. Stanley Ahmann and Marvin D. Glock, Evaluating Pupil Growth (Boston: Allyn and Bacon, 1958), pp. 1-3.

[17] Ernest O. Melby, "Role of Evaluation in Improving Teaching," Educational Leadership, 15:218-20, January, 1958.

evaluation of the educational system it is possible to be led into crash programs--programs that are not basically sound. He went on to point out that if those responsible for educational policy allow it to be thus influenced, policies may be so ill chosen as to result in our national undoing. He stated, "human survival depends on an education in human values, one which gives all of us awareness in the human race."[18]

Evaluation plays a very important part, declared one writer, in the development and improvement of higher education.[19] It involves the identification of higher educational needs, the ability of existing facilities to provide for existing needs, and proposals for bridging the gap between the needs and present facilities. Another writer added that evaluation also validates the hypothesis upon which the educational institutions operate, provides information basic to effective guidance and provides psychological security to the school staff, to the students, and to the parents.[20]

---

[18] Ibid., p. 219.

[19] A. L. Brumbaugh, "The Role of Evaluation in the Development and Improvement of Regional Programs of Higher Education," Journal of Experimental Education, 25:43-48, September, 1956.

[20] Smith, op. cit., pp. 7-9.

Ahmann and Glock pointed out that the principal developments which have contributed to educational evaluation today have occurred since 1900.[21] From this it is easy to see that the evaluation movement is relatively immature. As pointed out earlier, the tools of evaluation are far from perfect. They are, however, very essential to the production of a sound educational system.

To get a picture of what is being accomplished within a program, it is necessary to have some method of evaluating the efficiency of the program provided.

A statistical method is one device that can be employed, but it should be remembered, declared an authority, that a "statistical method is not a substitute for thought, but an aid--often an essential aid to thought. It is a means not an end."[22]

Brumbaugh brought out in his report that if a statistical method is chosen it needs to be kept as simple as possible, and it should be well planned before it is begun.[23] The plan should provide for such things as the collection of data, classification, computation, interpolation,

---

[21]Ahmann, op. cit., pp. 21-22.

[22]C. W. Odell, An Introduction to Educational Research (New York: Prentice-Hall, Inc., 1946), p. 3.

[23]Brumbaugh, op. cit., pp. 43-45.

and presentation. Statistical techniques used must be defensible, or else all of the conclusions derived from the data will be open to question.

The kind of evaluation with the greatest promise for helping to improve the educational program is that of product evaluation.[24] According to the authors, "evaluation in education signifies describing something in terms of selected attributes, and judging the degree of acceptability or suitability of that which has been described."[25] It may involve any aspect of education so long as the data from any program of educational evaluation is summarized so that it gives a picture of trends with respect to the attribute that is being studied.[26] Evaluation can suggest answers to a great number of educational questions if the data are thoughtfully interpreted.

However, educators need to keep in mind at all times that measures are inaccurate, especially when applied to persons, maintains Carl Gerbracht.[27] Educators need to

---

[24]"Evaluation," Encyclopedia of Educational Research (3rd ed.), p. 482.

[25]Ibid., p. 483.

[26]Ibid., p. 485.

[27]Carl Gerbracht, A Sourcebook of Readings in Education, Sixth Yearbook of the American Council on Industrial Arts Teacher Education (Bloomington, Illinois: McKnight & McKnight, 1957), pp. 304-305.

realize that they may still be mistaken in their judgments even though they used indicated facts as clues to assist in their value judgments. Too, it is easy to overlook facts and draw assumptions based on what the researcher wants to find.

Most teachers are concerned with evaluation on a limited scale. They are concerned with it as it relates to their immediate responsibilities. However, there are evaluation programs of a broad nature carried on, too. In October, 1949 the American Council on Education, through its Committee on Measurement and Evaluation initiated steps that led to an evaluation project involving the cooperative activity of eighteen colleges.[28] These colleges were each invited to send two representatives to a meeting that was held in Pittsburg, Pennsylvania in December, 1949. Six committees were then selected from this group to conduct a study of evaluation in regard to the objectives of education.

The improvement of instruction was seen by the committees as a major purpose of evaluation. This did not necessarily mean that instruction was poor, only that instruction could be improved through determination of its effects on students. Among the many factors considered were

---

[28]Committee on Measurement and Evaluation, General Education Exploration in Evaluation (Washington: American Council on Education, 1954), pp. 13-24.

the following: grading the students, keeping records, analyzing records, and determining what was to be done with the results.

One generalization that resulted from the studies of these various committees was that schools should provide a general education program, rather than a limited one, because outcomes are more closely interrelated.[29]

Schools that provide only one curriculum for their students, maintained Remmers and Gage, are neglecting their rightful duty because they are failing to provide for varying interests.[30] They pointed out that evaluation should not be used to maintain standards in violation of individual differences.

They further stated that one of the primary purposes of evaluation is to furnish data for guidance. They said that evaluations can guide teaching when they furnish diagnoses of specific strengths and weaknesses in the pupil's achievements. It can help determine the rightness of curriculums for the pupils and determine the degree to which education achieves the objectives set up for itself.[31]

---

[29] Ibid., p. 244.

[30] H. H. Remmers and N. L. Gage, Educational Measurement and Evaluation (New York and London: Harper & Bros., 1943), p. 6.

[31] Ibid., pp. 9-19.

While many authorities think that direct observation of the pupils is the best means of evaluation, Smith and Tyler believe that not all learning can be evaluated by observing behavior.[32] They declared that grades and records must in some instances be utilized. They said, "the fundamental reason for records is their value as a basis for more intelligent dealing with human beings."[33]

Carl Gerbracht supported this idea. He pointed out in his study that the results of testing and grading are of little value unless they are used to improve the educational process.[34] By applying thoughtful interpretation to records kept, it is possible to form a basis for understanding individuals better; by using the information thus made available it is possible to form a program to more nearly meet pupil needs.

COMPARATIVE STUDIES OF ACADEMIC ACHIEVEMENT

Information thus far presented reveals a definite need for evaluation and analysis of grades and records. This comparative study of industrial arts grades was a limited attempt at such an evaluation and analysis.

---

[32] Smith, op. cit., pp. 9-19.

[33] Ibid., p. 17.

[34] Gerbracht, op. cit., p. 326.

A diligent search was initiated to obtain information pertaining to this subject and to give credit for previous work by other authors. An exhaustive search revealed only one study that presented a comparative analysis of grades of industrial arts students. However, a few studies were located which employed similar comparative procedures. One of the studies made a comparison of the academic achievement of four groups of girls.[35] The groups compared were Dormitory, Sorority, Residents, and Non-Residents. They were compared for a four year period by means of their grade point averages. The presentation of information was made by statistical tables and explanations and the conclusion reached was that there was no instance where any one group exceeded the record of any other group by any significant amount.

Another study, a comparative study of the records of mathematics students, was made in Athens, Ohio by R. L. Morton and Leslie Miller.[36] They evaluated the records of

---

[35]Ross D. Herron, "A Comparative Study Of The Academic Achievement of Four Groups of Girls On The Campus Of Kansas State Teachers College Of Emporia For The Years 1934 to 1938" (unpublished Master's thesis, The Kansas State Teachers College, Emporia, 1939), p. 6.

[36]R. L. Morton and Leslie Haynes Miller, "A Comparative Study of Scholarship Records of Students Who Major in Mathematics," School Science and Mathematics, 36:965, December, 1936.

2262 graduates of Ohio University in an effort to discover how mathematics majors compared academically with majors in other areas. The comparison was a statistical one which ranked mathematics majors above all but the foreign language majors. Students in other majors, including industrial arts, ranked lower than the mathematics majors.

A study similar to the one by Morton and Miller was made by Cecil B. Read, at Wichita University, Wichita, Kansas.[37] The results of this study were strikingly similar to those in the Morton and Miller study but Read concluded his study by saying that before definite conclusions could be drawn much more evidence was needed.

In a correlation study by Terman and Oden[38] there was found to be a positive correlation between mechanical aptitude and intelligence scores. They stated that for years the industrial arts program has been used as the dumping ground for other departments to rid their classes of the less able students. The authors went on to state that within the counseling department, because of its size and the element of time, one often finds the counselors rushing the student into industrial arts classes because

---

[37]Cecil B. Read, "Comparative Records of Departmental Majors," School and Society, 47:126, January, 1938.

[38]L. M. Terman and N. H. Oden, The Gifted Child Grows Up (Stanford: Stanford University Press, 1947), p. 54.

they feel they are the easiest classes in which to place him without disturbing the program already underway. This is done without a critical analysis of the students record, as to intelligence quotient, aptitude, and grades. Teachers were often in error in that they tended to rate the gifted child below the unselected child in mechanical aptitude. They concluded that several mediums should be utilized in gathering information in preparation for counseling a student since the intelligent student was just as apt to be mechanically inclined as the student who was less academically inclined.

Since the beginning of the century there has been a great technological change in the structure of American living. The American schools have tried to keep up with this constant change in industry and professions. With its role to teach the fundamental subjects and aid students in their chosen vocation, the school has the tremendous task of evaluating each individual, so as to aid him in the selection of a vocation commensurate with his interests and abilities. Also, educators have the responsibility of evaluating programs of instruction to assure that they are meeting pupil needs.

CHAPTER III

MATERIALS USED AND GROUPS STUDIED

As stated in Chapter I this study was an attempt to discover whether or not there was any real difference in the achievement of students in the verbal areas as compared to the non-verbal areas of study at the college level.

The purpose of this chapter is to present the data obtained and the procedures and statistical compilations employed to compare the scholastic achievements of certain graduates of the Kansas State Teachers College, Emporia for the years 1951 through 1960. The areas of study selected were chosen as being representative of one of two groups designated as verbal and non-verbal. From the verbal area English, social science, and speech were selected. From the non-verbal area art, home economics and industrial arts were chosen.

After the major areas of study, both verbal and non-verbal, were selected, information was gathered which would allow the achievements of the graduates to be statistically compared.

Records maintained by the Registration Office were utilized to obtain the following information:

1. The names of graduates who were 30-hour majors.

2. The year of graduation.

3. The major area of study of graduates.

4. The sex of the graduates.

5. The grade-point averages for each graduate.

Records maintained by the Bureau of Tests and Measurements were used to obtain the decile ranking received on entrance tests of the graduates to be considered in the study.

A sample card such as those on which data were gathered is presented on page 75 in the appendix.

From the original data gathered, a tabular arrangement of data was presented in Table I listing the number of graduates for each area of study during the years denoted.

When the groups were established the individual scholastic record of each student was recorded by means of a four point system where A = 4 points, B = 3 points, C = 2 points, and D = 1 point. Grade-point averages were then computed for each graduate, for courses in his major, and for other courses taken to complete degree requirements. Grade-point averages were computed by dividing the number of course hours into the grade points earned. A sample of the college transcript appears in the appendix.

After the preliminary data had been gathered, the major course selections together with a tabulation of the

TABLE I

DISTRIBUTION OF KANSAS STATE TEACHERS COLLEGE GRADUATES BY SEX FOR THE YEARS 1951-60 ACCORDING TO THEIR MAJOR AREA OF STUDY

	English			Home Economics			Social Science			Industrial Arts			Speech			Art			Grand Total		
	M	F	Tot.	M	F	Tot.	M	F	Tot.	M	F	Tot.	M	F	Tot.	M	F	Tot.	M	F	Tot.
1960	1	3	4		8	8	4	2	6	11		11	5	1	6	2	4	6	23	18	41
1959	2	6	8		4	4	4	0	4	8		8	1	3	4	1	2	3	16	15	31
1958	4	3	7		9	9	5	1	6	13		13	3	2	5	2	3	5	27	18	45
1957	1	1	2		1	1	1	1	2	9		9	4	1	5	1	2	3	16	6	22
1956	0	2	2		2	2	6	1	7	3		3	1	0	1	0	2	2	10	7	17
1955	0	2	2		1	1	1	1	2	1		1	0	0	0	2	1	3	4	5	9
1954	2	4	6		5	5	7	0	7	6		6	4	3	7	0	0	0	19	12	31
1953	2	2	4		4	4	5	1	6	6		6	3	1	4	3	2	5	19	10	29
1952	3	2	5		1	1	6	1	7	7		7	1	3	4	0	4	4	17	11	28
1951	4	3	7		3	3	7	1	8	10		10	2	1	3	3	3	6	26	11	37
	19	28	47		38	38	46	9	55	74		74	24	15	39	14	23	37	177	113	290

graduates by decile ranking were listed in Table II. From this table the average decile ranking for each area of study was computed. While the author realizes that it is not the best of practices to average decile rankings, the procedure was used because data concerning general ability scores of the graduates was in many cases not on file. The averages computed were as follows:

1. English 6.83
2. Social Science 6.18
3. Home Economics 5.79
4. Speech 5.72
5. Art 5.00
6. Industrial Arts 4.85

TABLE II

DISTRIBUTION OF SELECTED 1951-1960 GRADUATES BY DECILE RANK AND MAJOR

Decile Rank	English	Speech	Social Science	Industrial Arts	Art	Home Economics
10	5	4	6	3	2	1
9	8	3	5	4	1	9
8	9	4	8	6	1	3
7	7	8	7	6	5	4
6	4	4	7	9	8	3
5	5	1	4	11	1	2
4	6	4	10	10	7	9
3	0	4	6	11	8	2
2	2	4	0	7	2	2
1	1	3	2	7	2	3
Total	47	39	55	74	37	38

As a further comparison of graduates by their major fields, Table III (page 36) was set up. It was based on the decile ranking received on entrance tests and shows the percentage of graduates for each decile and the percentage in the first through the fifth and the sixth through the tenth decile.

From a study of the data thus presented some facts of possible significance can be discerned. The average decile computed from Table II or the percentages listed in Table III indicate that the graduates of the verbal areas of study achieved higher test scores on their college entrance examinations than did those of the non-verbal group. This would indicate that in general those students who ranked high on the entrance tests tended to choose the verbal areas of study as a major.

A survey of the percentages reveals that a larger percentage of the majors in the non-verbal field ranked in the first decile than was true in the verbal group. Also it reveals that industrial arts had the highest percentage and English the lowest percentage in the first decile. It further reveals that the verbal group had a much larger percentage in the tenth decile than did the non-verbal group. The highest percentage in the tenth decile was in social science, closely followed by English and speech. Home economics had the lowest percentage in the tenth decile.

TABLE III

PER CENT OF GRADUATES IN EACH DECILE
FOR SELECTED MAJOR AREAS OF STUDY

Major Department	No.of Grads	Per Cent in Each Decile										Per cent in	
		I	II	III	IV	V	VI	VII	VIII	IX	X	I to V	VI to X
Industrial Arts	74	9.5	9.5	14.9	13.5	14.9	10.8	8.0	8.0	5.4	4.0	63	37
Home Economics	38	7.8	5.3	5.3	23.6	5.3	7.8	10.5	7.8	23.6	2.6	48	52
Art	37	5.4	5.4	21.6	19.0	2.7	21.6	12.7	2.7	2.7	5.4	55	45
English	47	2.1	4.2	0.0	12.8	10.6	8.5	15.0	19.0	17.0	10.6	30	70
Speech	39	7.6	10.2	10.2	10.2	2.5	10.2	20.5	10.2	7.6	10.2	41	59
Social Science	55	3.6	0.0	10.9	18.1	7.2	12.7	12.7	14.1	9.0	10.9	40	60

While the verbal areas had a larger percentage of graduates in the upper five deciles than did the non-verbal group, all of the groups are represented in nearly every decile.

Using the average decile ranking as the only criteria for measurement of expected achievement one would assume that the English graduates would achieve the highest grade-point averages and the industrial arts graduates the lowest grade-point averages.

As the first step in measuring the scholastic accomplishments of the graduates, Table IV (page 38) was set up to provide a frequency distribution of the males and females according to an established grade index.

The distribution in Table IV revealed that a larger percentage of the females tended to have higher grade-point averages both in their major and in other courses taken. Statistical computations were then made to establish more accurate comparisons to see if the differences were significant.

Measures of central tendency and variability were established from the frequency distribution in Table IV for the purpose of comparing the achievement of the male and female graduates. This comparison was made first in order to determine whether there was any real difference in the scholastic achievement of males and females.

TABLE IV

FREQUENCY DISTRIBUTION OF SELECTED MALE AND FEMALE GRADUATES BY GRADE-POINT AVERAGES WITHIN AND OUTSIDE THEIR MAJOR

Grade Index	Frequency of Males for Major	Frequency of Females for Major	Frequency of Males for Other	Frequency of Females for Other
4.00	2	2	0	0
3.90 - 3.99	1	3	1	0
3.80 - 3.89	0	5	0	0
3.70 - 3.79	3	4	1	3
3.60 - 3.69	4	2	1	2
3.50 - 3.59	7	10	1	4
3.40 - 3.49	8	10	0	2
3.30 - 3.39	12	6	2	8
3.20 - 3.29	10	7	2	8
3.10 - 3.19	12	7	11	2
3.00 - 3.09	19	5	5	5
2.90 - 2.99	11	8	2	11
2.80 - 2.89	13	2	9	9
2.70 - 2.79	13	6	8	6
2.60 - 2.69	8	7	16	8
2.50 - 2.59	12	5	12	9
2.40 - 2.49	9	6	18	6
2.30 - 2.39	14	7	22	10
2.20 - 2.29	7	6	19	4
2.10 - 2.19	3	3	14	3
2.00 - 2.09	4	3	18	8
1.90 - 1.99	3	0	7	4
1.80 - 1.89	2	1	7	1
1.70 - 1.79	0	0	1	0
Total	177	113	177	113

Two males and 1 female achieved a grade-point average of 1.80 - 1.90 in their major area of study and 7 males and 1 female achieved a grade-point average of 1.80 - 1.90 for courses taken outside of their major field.

> The value of a measure of central tendency is twofold. First, it is an "average" which represents all of the scores made by the group, and as such gives a concise description of the performance of the group as a whole; and second, it enables us to compare two or more groups in terms of typical performance.[1]

There are three measures of central tendency in common use, (1) the arithmetic mean, (2) the median, and (3) the mode. The arithmetic mean was chosen as being most appropriate for this particular problem. The formula used in this study to derive the mean was as follows:

$$M = M' + i \times \frac{\Sigma fx'}{N}$$

The symbols used in this formula were:

M = mean (true)

M' = assumed mean

i = interval

Σ = sum of

f = frequency of cases per interval

x = deviation from assumed mean

N = number of cases

The mean grade-point average obtained in the major area of study was found, using the above formula, to be 2.89 for the males and 3.03 for the females. The means of the grades for courses taken outside of the major were 2.45 for

---

[1]Henry E. Garrett, Statistics in Psychology and Education. (New York: Longmans, Green and Co.), p. 27.

the males and 2.67 for the females. These means revealed that the females considered in this study, as a group, averaged higher grade-point averages both in their major areas of study and in courses outside of their major than did the males. Further analysis was needed, however, to determine other factors and to establish the real value of the difference in means.

The measures of central tendency provide data that are typical or representative of a set of scores but they do not tell the complete story, that is, they do not indicate the scatter of the scores nor the extremes. Measures of variability add to the picture of over-all achievement by providing information relative to the "spread" or "scatter" of the scores around the central tendency.

There are four commonly used measures of variability, (1) the range; (2) the quartile deviation; (3) the average deviation; and (4) the standard deviation. For this study the range was computed to show the extremes of the scores and the standard deviation was computed because it is generally considered to be the most stable index of variability.

Table IV reveals that the range of the grade index in the major area of study was exactly the same (4.00 - 1.80 or 2.20) for males and females. The range for the two sexes differed somewhat for courses taken outside their

major. From the preceding data it will be observed that, (1) for males the range was 4.00 - 1.70 or 2.30; (2) for females the range was 3.80 - 1.80 or 2.00. The males achieved grade-point averages that were higher and grade-point averages that were lower than those achieved by the females. The grade-point averages of the females for these courses were thus more closely grouped around the point of central tendency while those of the males were more widely scattered.

To further enlarge upon the achievement picture of these two groups the standard deviation was computed from the data given in Table IV using the following formula:

$$\sigma = i \sqrt{\frac{\Sigma fx'^2}{N} - c^2}$$

The symbols used in this formula were:

σ = sigma or standard deviation

i = interval

Σ = sum of

fx' = frequency of scores per interval times the deviation in class intervals from the assumed mean.

N = number of cases

c = correction applied to assumed mean to derive true mean.

The standard deviations as determined by the above method were as follows:

1. (SD) for males in their major area of study .47
2. (SD) for females in their major area of study .56
3. (SD) for males in courses outside their major .69
4. (SD) for females in courses outside their major .56

From this it can be seen that the males were less variable than the females in grade-point averages received for the courses in their major area of study and slightly more variable than the females in grade-point averages received for courses outside of their major.

Computations were then made to determine how significant the differences discovered actually were. "A difference is called significant when the probability is high that it cannot be attributed to chance (i.e., temporary and accidental factors) and hence represents a true difference between population means."[2] Non-significant differences then would be those which might easily be attributable to chance variations in sampling or measurements.

Judgments concerning differences are never absolute but experimenters and research workers have for convenience chosen arbitrary standards--called levels of significance--of which the .05 and the .01 levels are most often used.

---

[2] Ibid., p. 212.

The .01 level is more exacting than the .05 level. If the .01 level of significance is retained it indicates that not more than once in 100 trials would a difference of this size arise if the true difference were zero. If the .05 level of significance is retained it indicates that not more than once in 20 repetitions of the same experiment would a difference as large as, or larger than, that found arise if the true difference were zero. Stated in another way it means that it is not likely that the difference could have been as large as 1.96σ (at the .05 level) by "chance" variations in sampling. It is therefore probable that a real difference exists. In order to determine the level of significance it was necessary to compute the standard error. This was accomplished, for large samples, by using the following formula:

$$\sigma D = \sqrt{\frac{\sigma^2 1}{N_1} + \frac{\sigma^2 2}{N_2}}$$

The symbols used in this formula were:

σD = the standard error of the difference.

$\frac{\sigma^2 1}{N_1}$ = the squared sigma of group one divided by the number of cases in group one.

$\frac{\sigma^2 2}{N_2}$ = the squared sigma of group two divided by the number of cases in group two.

Once this standard error was computed a critical ratio was found by dividing the difference of the sample

means by the standard error. This critical ratio provided the figure for determining the level of significance.

It has been established that ± 2.58 marks off points on the normal distribution to the right and left of which fall one per cent of the cases in the normal distribution. An example of a normal distribution curve showing sigma variation is shown on page 45.

Thus if the critical ratio was as large as 2.58, or larger, the difference could be considered significant at the .01 level.

It has further been established that ± 1.96 marks off points on the normal distribution to the right and left of which lie five per cent of the cases. Therefore, if the obtained critical ratio was as large as, or larger than, 1.96σ, the difference could be considered significant at the .05 level. These critical ratios are considered valid by Garrett when the study contains thirty cases or more.[3] For studies involving less than thirty cases it is necessary to enter prepared tables because the "t" distribution lies under the normal curve.

The critical ratio for the means of grade-point averages in the major areas of study of the male and female graduates being considered was 2.06. This is greater than

---

[3] Ibid., p. 223

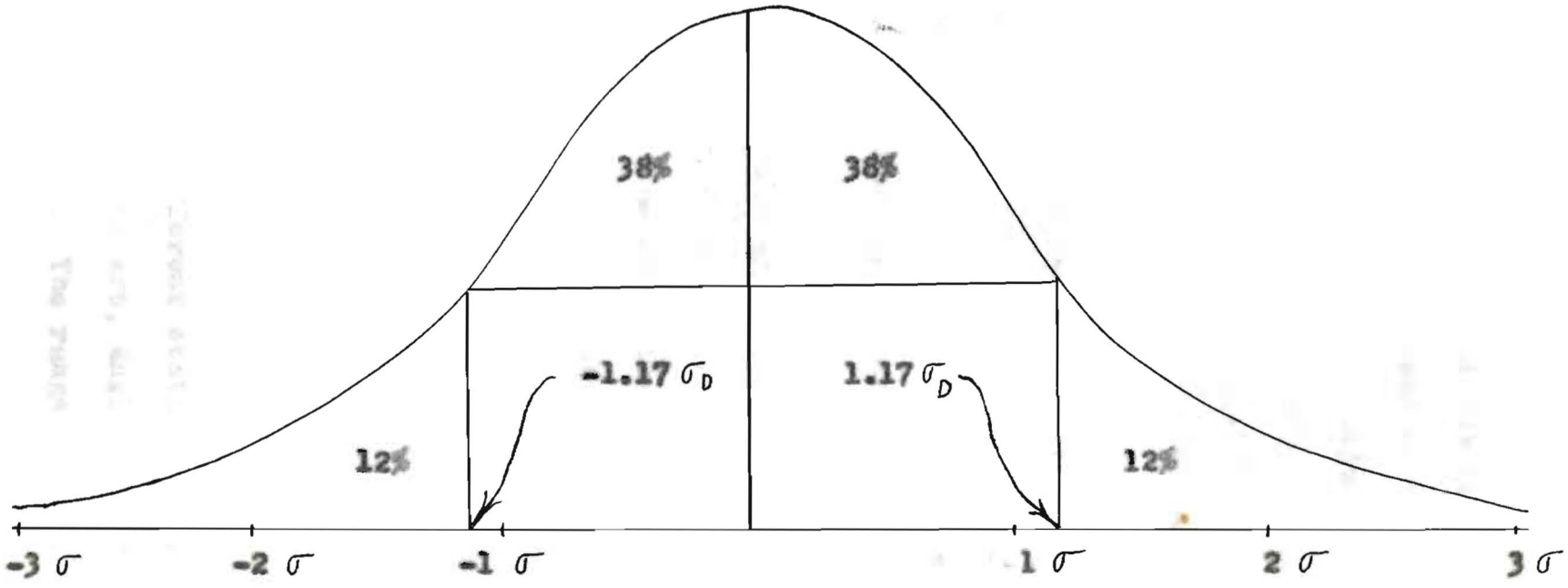


FIGURE 1

ILLUSTRATION OF A NORMAL DISTRIBUTION CURVE
SHOWING SIGMA VARIATIONS

the 1.96 which establishes the .05 level of significance. The critical ratio for the means of the grade-point averages of courses taken outside of the major area of study was computed to be 3.00. This is larger than the 2.58 which establishes the .01 level of significance. These computations, therefore, indicate that there is a real difference between the grade-point averages of the males and females.

Because it was established that there was a real difference in the grade-point averages of the males and females, only the data on the performance of the males was utilized to make further comparative studies of achievement except in the case of the home economics majors. The data on the home economics majors was retained because the author felt that it might further enlarge on the over-all picture of achievement of the graduates.

With this in mind, Table V, which is a frequency distribution of the grade-point averages of the male graduates in English, social science, speech, industrial arts and art, together with the female graduates in home economics, was set up.

To make scholastic achievement comparisons of the graduates of each particular area being studied, it was necessary to use different statistical procedures since the number of cases in the art, English, and speech departments was less than thirty. The range was not included in

TABLE V

FREQUENCY DISTRIBUTION OF SELECTED GRADUATES EARNING VARIOUS GRADE-POINT AVERAGES FOR EACH MAJOR AREA OF STUDY

Grade Index	English		Speech		Soc. Sci.		Ind. Arts		Art		Home Ec.	
	Major	Other	Major	Other	Major	Other	Major	Other	Major	Other	Major	Other
4.00 -	0	0	0	0	2	0	0	0	0	0	2	0
3.90 - 3.99	1	0	0	0	0	1	1	0	0	0	1	0
3.80 - 3.89	0	0	0	0	0	0	0	0	0	0	1	0
3.70 - 3.79	0	1	1	0	0	0	1	0	1	0	3	1
3.60 - 3.69	1	0	1	0	1	1	1	0	0	0	2	3
3.50 - 3.59	0	0	1	0	4	1	1	0	1	0	2	1
3.40 - 3.49	0	0	2	0	1	0	4	0	1	0	2	1
3.30 - 3.39	1	1	1	0	2	0	6	1	1	0	3	1
3.20 - 3.29	0	1	0	2	3	0	4	0	3	0	2	3
3.10 - 3.19	3	2	2	2	3	4	4	2	0	1	2	1
3.00 - 3.09	3	1	2	0	5	3	6	1	1	0	1	0
2.90 - 2.99	0	1	1	0	3	0	6	1	2	0	1	4
2.80 - 2.89	0	1	2	2	2	0	9	5	1	1	2	1
2.70 - 2.79	2	1	1	0	1	5	9	1	0	1	2	1
2.60 - 2.69	0	2	1	2	3	5	3	6	1	1	2	1
2.50 - 2.59	1	2	4	2	1	4	4	2	2	2	3	3
2.40 - 2.49	1	4	0	1	3	5	5	7	0	1	0	2
2.30 - 2.39	3	0	2	1	4	4	5	16	0	1	2	5
2.20 - 2.29	0	2	2	3	4	4	1	5	0	4	3	3
2.10 - 2.19	1	0	0	3	1	3	1	8	0	0	1	2
2.00 - 2.09	0	0	0	3	2	4	2	10	0	0	1	5
1.90 - 1.99	2	0	1	3	0	0	0	5	0	0	0	0
1.80 - 1.89	0	0	0	0	1	2	1	3	0	2	0	0
1.70 - 1.79	0	0	0	0	0	0	0	1	0	0	0	0
Totals	19	19	24	24	46	46	74	74	14	14	38	38

comparisons because this statistic becomes unreliable when groups are small or there are large gaps in the frequency distribution. It can be noted that in Table V there are some wide gaps in the distribution. Also the method employed to determine the standard deviation was changed, because when samples are small (less than 30), the standard deviations are more accurately computed by using the following formula:

$$SD = \sqrt{\frac{\Sigma x^2}{(N-1)}}$$

The symbols used in this formula were:

SD = standard deviation.

Σ = sum of.

X^2 = square of the deviations from the mean for the group.

N-1 = number of cases minus one.

From the distribution in Table V the means and the standard deviations of the groups were computed and the results were presented in tabular form in Table VI (page 49).

As might be expected, all of the groups received higher mean grade-point averages in their major than they did in other courses taken. According to the results given in Table VI, the three non-verbal groups achieved higher mean grade-point averages in their major than did the three verbal groups. However, for other courses taken the situation was nearly reversed.

In the distribution of mean grade point averages industrial arts majors ranked below the majors in art and home economics and above the majors in English, speech, and social science in the major area of study. Majors in industrial arts ranked above majors in speech and art and below majors in home economics, social science, and English in mean grade point averages in courses outside their major.

TABLE VI

MEANS AND STANDARD DEVIATION OF THE GRADE-POINT AVERAGES FOR THE MAJOR AREAS OF STUDY

Major	Means		SD (σ)	
	Major	Other	Major	Other
English	2.80	2.78	.559	.394
Social Science	2.86	2.59	.537	.461
Speech	2.87	2.35	.497	.436
Industrial Arts	2.89	2.48	.422	.441
Home Economics	3.08	2.58	.563	.545
Art	3.10	2.42	.373	.359

The achievement picture according to the means listed in Table VI was presented in order of descending rank of grade-point averages in Table VII (page 50) for more convenient reading. The listing is by rank according to the average mean, both for the major and for other courses taken.

TABLE VII

RANKING OF MAJOR FIELDS BY MEAN GRADE-POINT AVERAGES IN MAJOR AND IN OTHER SUBJECTS

For Major Courses		For Other Courses	
Art	3.10	English	2.78
Home Economics	3.08	Social Science	2.59
Industrial Arts	2.89	Home Economics	2.58
Speech	2.87	Industrial Arts	2.48
Social Science	2.86	Art	2.42
English	2.80	Speech	2.35

To add another dimension to the description of the group achievement, Table VIII (page 51) was prepared. This table ranks the major areas of study by the standard deviation of the obtained grade-point averages, from lowest to highest, both for the major and for other courses taken.

From Table VIII it can be seen that in the major area of study the art graduates varied the least from the mean while the grade-point averages of the home economics group had the largest spread. In the other courses taken, the grade-point averages of the home economics graduates had the widest spread or scatter while those of the art graduates had the least.

TABLE VIII

STANDARD DEVIATIONS FROM THE MEANS FOR MAJOR AREAS OF STUDY AND FOR OTHER COURSES TAKEN

SD For Major		SD For Other	
Home Economics	.563	Home Economics	.545
English	.559	Social Science	.461
Social Science	.537	Industrial Arts	.441
Speech	.497	Speech	.436
Industrial Arts	.422	English	.394
Art	.373	Art	.359

To further compare the performance of the departmental graduates, computations were made to establish whether or not the differences in the mean grade-point averages were significant. Since there were less than thirty graduates in some of the departments studied, a different method was employed for computing the means and the level of the significance of the difference between means than that used for the previous comparisons. An example of how the means were figured and how the following formulas were used to derive the critical ratio appears in the appendix, page 74.

To get a better estimate of the true standard deviation (σ in the population) the sums of the squares of the deviations taken around the means of the two groups being compared were "pooled" into a single standard deviation using the following formula:

$$SD = \sqrt{\frac{(X_1-M_1)^2 + (X_2-M_2)^2}{(N_1-1) + (N_2-1)}}$$

Symbols used in this formula were:

SD = standard deviation.

$(X_1-M_1)^2$ = sum of the square deviation around the mean of group I.

(N_1-1) = number of cases in group one, minus one.

(N_2-1) = number of cases in group two, minus one.

Then, using this "pooled" standard deviation, the standard error of the difference of the means was computed using the formula;

$$SE_D = SD \sqrt{\frac{N_1 + N_2}{N_1 N_2}}$$

Symbols used in this formula were:

SE_D = standard error of the difference of the means.

SD = standard deviation ("pooled" in this case)

N_1 = number of cases in group I.

N_2 = number of cases in group II.

The figure thus arrived at was used to find "t", which is the critical ratio for small samples, by means of the following formula:

$$t = \frac{(M_1 - M_2)}{SE_D}$$

Symbols used in this formula were:

t = critical ratio.

$(M_1 - M_2)$ = mean of group one minus the mean of group two.

SE_D = standard error of the difference of the means.

The prepared tables, mentioned on page 45, for the "t" distribution were then consulted to determine the level of the significance of the difference of the means for the various groups studied.

The significance of the difference between the means of the various groups was then summarized and presented in Tables IX through XII.

In the verbal group it can be seen that there was no significant difference in the achievement of any of the groups within the major area of study. Neither was there any significant difference in the achievement of these groups for other courses taken, except in the case of English and speech. In this case, for other courses taken, there was a significant difference at the .02 level with the achievement of English majors surpassing that of the speech majors.

In the non-verbal group there was a significant difference in achievement only at the .10 level within the major area of study.

TABLE IX

SUMMARY OF THE SIGNIFICANCE OF THE DIFFERENCES OF THE MEANS FOR GRADE-POINT AVERAGES RECEIVED IN THE MAJOR FIELD OF STUDY FOR THE VERBAL GROUPS AND THE NON-VERBAL GROUPS

Departments	Mean GPA for Major	Difference of Means	Level of Significance				
			Not Significant	.10	.05	.02	.01
English Speech	2.80 2.91	.11	X				
English Social Science	2.80 2.86	.06	X				
Speech Social Science	2.91 2.86	.05	X				
Industrial Arts Home Economics	2.87 3.02	.15			X		
Industrial Arts Art	2.87 3.10	.23			X		
Home Economics Art	3.02 3.10	.08	X				

TABLE X

SUMMARY OF THE SIGNIFICANCE OF THE DIFFERENCES OF THE MEANS FOR GRADE-POINT AVERAGES RECEIVED IN THE MAJOR FIELD OF STUDY FOR INDUSTRIAL ARTS AND THE VERBAL GROUP

Departments	Mean GPA for Major	Difference of Means	Level of Significance				
			Not significant	.10	.05	.02	.01
Industrial Arts English	2.87 2.80	.07	X				
Industrial Arts Speech	2.87 2.91	.04	X				
Industrial Arts Social Science	2.87 3.10	.01	X				

TABLE XI

SUMMARY OF THE SIGNIFICANCE OF THE DIFFERENCES OF THE MEANS FOR GRADE-POINT AVERAGES RECEIVED IN THE MAJOR FIELD OF STUDY FOR ART AND THE VERBAL GROUP

Departments	Mean GPA for Major	Difference of Means	Level of Significance				
			Not Significant	.10	.05	.02	.01
Art English	3.10 2.80	.30	X				
Art Speech	3.10 2.91	.19	X				
Art Social Science	3.10 2.86	.24	X				

TABLE XII

SUMMARY OF THE SIGNIFICANCE OF THE DIFFERENCES OF THE MEANS FOR GRADE-POINT AVERAGES RECEIVED IN THE MAJOR FIELD OF STUDY FOR HOME ECONOMICS AND THE VERBAL GROUP

Departments	Mean GPA for Major	Difference of Means	Not Significant	.10	.05	.02	.01
Home Economics English	3.02 2.80	.22	X				
Home Economics Speech	3.02 2.91	.11	X				
Home Economics Social Science	3.02 2.86	.16	X				

TABLE XIII

SUMMARY OF THE SIGNIFICANCE OF THE DIFFERENCES OF THE MEANS FOR GRADE-POINT AVERAGES RECEIVED IN COURSES OUTSIDE THE MAJOR FIELD OF STUDY FOR THE VERBAL GROUPS AND THE NON-VERBAL GROUPS

Departments	Mean GPA for Major	Difference of Means	Level of Significance				
			Not Significant	.10	.05	.02	.01
English Speech	2.77 2.44	.33				X	
English Social Science	2.77 2.58	.19	X				
Speech Social Science	2.44 2.58	.14	X				
Industrial Arts Home Economics	2.33 2.72	.39	X				
Industrial Arts Art	2.33 2.42	.09	X				
Home Economics Art	2.72 2.42	.30		X			

TABLE XIV

SUMMARY OF THE SIGNIFICANCE OF THE DIFFERENCES OF THE MEANS FOR GRADE-POINT AVERAGES RECEIVED IN COURSES OUTSIDE THE MAJOR FIELD OF STUDY FOR INDUSTRIAL ARTS AND THE VERBAL GROUP

Departments	Mean GPA for Other	Difference of Means	Level of Significance				
			Not Significant	.10	.05	.02	.01
Industrial Arts English	2.33 2.77	.44					X
Industrial Arts Speech	2.33 2.44	.11	X				
Industrial Arts Social Science	2.33 2.58	.25	X				

TABLE XV

SUMMARY OF THE SIGNIFICANCE OF THE DIFFERENCES OF THE MEANS FOR GRADE-POINT AVERAGES RECEIVED IN COURSES OUTSIDE THE MAJOR FIELD OF STUDY FOR ART AND THE VERBAL GROUP

Departments	Mean GPA for Other	Difference of Means	Level of Significance				
			Not Significant	.10	.05	.02	.01
Art English	2.42 2.77	.35				X	
Art Speech	2.42 2.44	.02	X				
Art Social Science	2.42 2.58	.16	X				

TABLE XVI

SUMMARY OF THE SIGNIFICANCE OF THE DIFFERENCES OF THE MEANS FOR GRADE-POINT AVERAGES RECEIVED IN COURSES OUTSIDE THE MAJOR FIELD OF STUDY FOR HOME ECONOMICS AND THE VERBAL GROUP

Departments	Mean GPA for Other	Difference of Means	Level of Significance				
			Not Significant	.10	.05	.02	.01
Home Economics English	2.72 2.77	.05	X				
Home Economics Speech	2.72 2.44	.28			X		
Home Economics Social Science	2.72 2.58	.14	X				

When the achievement of the industrial arts graduates was compared with that of the graduates in the verbal group there was no significant difference found to exist in the major area of study. For other courses taken there was no significant difference between the achievement of the industrial arts graduates and speech and social science graduates but there was a significant difference at the .01 level between the industrial arts and English graduates, with the English majors exhibiting the best record.

The achievement of the graduates in the other two non-verbal areas, art and home economics, when compared with the majors in the verbal group were found to have no significant differences in the major area of study. However, for other courses taken there was a significant difference at the .02 level between art and English majors and at the .05 level between home economics and speech majors, with English majors surpassing art majors and home economic majors surpassing speech majors in mean grade-point average achieved.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The principal objective of this study was the comparison of industrial arts graduates with graduates in five other major areas of study with respect to the decile ranking received on entrance tests and mean grade-point averages attained in the major area of study and in courses outside the major field. The study was undertaken in an effort to determine whether industrial arts graduates at the college level were as well prepared, as far as scholastic achievement was concerned, as majors in other areas.

The records of two hundred and ninety graduates for the years 1951 through 1960 were examined. The two hundred and ninety graduates whose records were examined were thirty-hour majors who had completed a minimum of ninety hours of work at Kansas State Teachers College.

Comparisons of the number and percentage of students in each decile ranking for each major area of study were made by tabulations and simple percentage calculations. (Tables II and III pages 34 and 36.)

The number of cases in any department in any decile or decile group was not sufficiently large to justify

sweeping conclusions or to give absolute tendencies. However, certain tendencies were evident which tended to reject the first hypothesis upon which this study was based, that is, that the industrial arts students as a group were composed of approximately the same percentage of students from the upper and lower decile rankings on the entrance examinations as were groups of students in other major areas of study. Information gathered showed that industrial arts had the lowest percentage of graduates in the top five deciles and the highest percentage in the lowest five deciles of any group studied. However, industrial arts was represented in all of the ten decile groups.

Comparisons of scholastic achievement were made, both as to the major subject and as to work exclusive of the major. These comparisons were made by computing means, standard deviations, ranges and levels of significance of the differences in means.

The achievement of the males was first compared with that of the females to determine whether a mixed group within the major would significantly affect further comparisons. Statistical comparisons indicated that there was a real difference in the scholastic achievement of males and females. Therefore, it was decided that the remainder of the study would be limited to male graduates only, except in the case of home economics. Home economics, while it was

composed of all female graduates, was retained as a comparative group because the writer believed it might add to the study to retain it.

The scholastic achievement records of the graduates of the six majors were statistically compared and the second hypothesis which stated that industrial arts students will achieve grades approximately equal to students in other areas was considered to be valid. There was no significant difference, at the .05 level of confidence, in the scholastic achievement of the groups in the non-verbal area (industrial arts, home economics, and art) either in the major field or for other courses taken. There was no significant difference in the scholastic achievement of the verbal groups (English, speech, and social science) for courses taken in their major. For courses outside their major there was a significant difference at the .02 level between English and speech majors, with those in English surpassing those in speech in mean grade-point average.

There was no significant difference, at the .05 level of confidence, when the mean grade-point average achieved by industrial arts graduates was compared with the mean grade-point averages achieved by the other five groups in the major field of emphasis. For courses other than the major, only English graduates achieved significantly higher grade-point averages than did industrial arts graduates.

While there were some variations in the achievement of the groups, the writer feels that a variation in grading systems employed by different teachers and different departments may well account for some of these variations.

From the data presented, the writer would draw these conclusions:

1. Females had greater scholastic success than did males.
2. The majority of industrial arts students came from the lower 50 per cent of the decile groups.
3. Graduates majoring in departments other than industrial arts did not achieve significantly higher in their major field than did the industrial arts major.
4. Graduates majoring in speech, art, social science, and home economics did not achieve significantly higher in courses outside their major field than did the industrial arts graduates. However, the English majors did achieve significantly higher outside their major than did industrial arts graduates.
5. In areas that do not depend heavily on verbal ability there was no significant difference in group achievement.

6. Majors in the verbal area varied more in achievement within their major and for other courses taken than did those in the non-verbal area.

The findings of this study indicate that the quality of the graduates of industrial arts as measured by scholastic achievement, is equivalent to that of most other graduates going out to teach. These graduates should, therefore, influence the type of student taking part in the industrial arts program in the public schools and help to raise the prestige of persons in industrial arts and eliminate some of the criticism directed at the program.

Since the study indicated that both the verbal and non-verbal groups were represented by students from all ten decile groups (based on entrance examinations) it would indicate that there were other factors besides verbal ability which entered into the choice of a major area of study.

The author realizes that this study, since it was conducted at the college level, may not be representative of the situation as it exists in the public schools. He therefore recommends that similar studies be undertaken at the junior high and high school levels.

BIBLIOGRAPHY

BIBLIOGRAPHY

Ahmann, J. Stanley, and Marvin D. Glock. Evaluating Pupil Growth. Boston: Allyn and Bacon, 1958. 605 pp.

AIAA Research Committee. "Research Report," The Industrial Arts Teacher. XVII No. 3 (January-February, 1959) p. 19.

Alpert, Harvey, and R. O. Stripling. "A Comparison of Marking Practices," Educational Research Bulletin, 34:321-29, January, 1955.

Bestor, Arthur. "A Crisis of Purpose," Vital Speeches of the Day. Vol. XXIV, No. 23 (September 15, 1958) pp. 723-728.

Braumbaugh, A. L. "The Role of Evaluation in the Development and Improvement of Regional Programs of Higher Education," Journal of Experimental Education, 25:43-48, September, 1956.

Buchta, J. W. "A Congress on Education," School and Society, 87:417-18, October 24, 1959.

Buttacavoli, Russell Francis. "Correlation of the Intelligent Quotient, Mechanical Aptitude and Grades of Industrial Arts Students." Unpublished Masters Thesis, Chico State College, California, January, 1960. 60 pp.

Committee on Measurement and Evaluation. General Education Explorations in Evaluation. Washington: American Council on Education, 1954. 302 pp.

Conant, James B. "The Prestige Image and Industrial Education," Industrial Arts and Vocational Education, Vol. 50, No. 1 (January, 1961), p. 15.

"Evaluation," Encyclopedia of Educational Research (3rd ed.), New York: The Macmillan Company, 1960.

Fadiman, Clifton. "Roots of the School Dilemma," The Saturday Review, 42:13-21, September 12, 1959.

Ferguson, Charles W. "Excellence For What?" National Parent Teacher Magazine, 55:7-8, September, 1960.

Fischer, John H. "Effective Modern Education As The Educator Sees It," National Education Association Journal.

Garrett, Henry E. Statistics In Psychology and Education. New York, London, and Ontario: Longmans, Green and Co., 1958. 478 pp.

Gerbracht, Carl. A Sourcebook of Readings in Education. Sixth Yearbook of the American Council on Industrial Arts Teacher Education. Bloomington, Illinois: McKnight and McKnight, 1957. 329 pp.

Green, Harry A., Albert N. Jorgensen, J. Raymond Gerberich. Measurement and Evaluation in the Secondary School. New York: Longmans, Green and Company, 1954. 670 pp.

Guest, Lester P. Beginning Statistics. New York: Thomas Y. Crowell Company, 1957. 255 pp.

Herron, Ross D. "A Comparative Study of The Academic Achievement of Four Groups of Girls on The Campus of Kansas State Teachers College of Emporia For the Years 1934 to 1939." Unpublished Master's thesis, The Kansas State Teachers College, Emporia, April, 1939. 22 pp.

Hornbake, R. Lee. "Professional Growth In Industrial Arts Education," The Industrial Arts Teacher. Vol. XIX, No. 2 (November-December, 1959), pp. 13-15.

"Industrial Arts," Encyclopedia of Educational Research (3rd ed.), New York: The Macmillan Company, 1960. pp. 688-695.

Institute for Communication Research, Voters and Their Schools," NEA Journal, March, 1961. pp. 29-30.

Justman, Joseph. "The School and the Intellectual," The Educational Forum, XXV (November, 1960), 30-33.

Kirk, President Grayson. "Education for The Future," Vital Speeches of The Day. Vol. XXV, No. 4 (December 1, 1958), pp. 118-121.

McMurrin, Sterling M. "A Crisis of Conscience," The Saturday Review, September 16, 1961, pp. 56-60.

Malby, Ernest O. "Role of Evaluation in Improving Teaching," Educational Leadership, 15:218-20, January, 1958.

Morton, R. L. and Leslie Haynes Miller. "A Comparative Study of the Scholarship Records of Students Who Major in Mathematics," School Science and Mathematics, 36:965-67, December, 1936.

Odell, C. W. An Introduction to Educational Research. New York: Prentice-Hall, Inc. 283 pp.

Odell, Charles W. An Introduction to Educational Statistics. New York: Prentice-Hall, Inc., 1946. 269 pp.

Ofiesh, Gabriel D. "Balance and Perspective in Education," Vital Speeches of The Day. Vol. XXIV, No. 11 (March 5, 1958), pp. 342-46.

Read, Cecil B. "Comparative Records of Departmental Majors," School and Society, 47:126-27, January, 1938.

Regnier, Arthur W. "The History and Development of Industrial Arts in the Public Schools of Kansas." Unpublished Master's thesis, The Kansas State Teachers College, Emporia, May, 1933. 66 pp.

Remmers, H. H. and N. L. Gage. Educational Measurement and Evaluation. New York and London: Harper and Brothers, 1943. 580 pp.

Rickover, Admiral H. G. "European and American Secondary Schools," Vital Speeches of The Day. Vol. XXIV, No. 22 (September 1, 1958), pp. 698-700.

Smith, Eugene R., Ralph W. Tyler, and the Evaluation Staff. Appraising and Recording Student Progress. Vol. III of Adventure in American Education. 5 vols. New York and London: Harper and Brothers, 1942. 550 pp.

Smith, Homer J. "Objective Measurement in Industrial Education," Industrial Education Magazine, 31:331-36, March, 1930.

Terman, L. M. and N. H. Oden. The Gifted Child Grows Up. Stanford: Stanford University Press, 1947.

United States Congress, House of Representatives, Committee on Appropriations. Review of The American Educational System. Hearings before Subcommittee, 86d Congress 2d Session, February 3, 1960. Washington: Government Printing Office, 1960.

Weglein, David Enrich. The Correlation of Abilities of High School Pupils. Baltimore, Maryland: John Hopkins University Press, 1917. 100 pp.

APPENDIX

A HYPOTHETICAL PROBLEM TO DISCOVER STATISTICAL SIGNIFICANCE

Formulas used:

$$SD = \sqrt{\frac{\Sigma(X_1 - M_1)^2 + \Sigma(X_2 - M_2)^2}{(N_1 - 1) + (N_2 - 1)}}$$

$$SE_D = SD\sqrt{\frac{N_1 + N_2}{N_1 N_2}}$$

$$t = \frac{M_1 - M_2 - 0}{SE_D}$$

Substituting into Formulas:

$$SD = \sqrt{\frac{110 + 352}{14}} = 5.74$$

$$SE_D = 5.74\sqrt{\frac{6 + 10}{60}} = 2.96$$

$$t = \frac{(30-24) - 0}{2.96} = 2.03$$

Group I ($N_1 = 6$)

Scores (X_1)	X_1	X_1^2
28	-2	4
35	5	25
32	2	4
24	-6	36
26	-4	16
35	5	25
180		110

$6\overline{)180}$

$M_1 = 30$

$N_1 - 1 = 5$

$N_2 - 1 = 9$

Group II ($N_2 = 10$)

Scores (X_2)	X_2	X_2^2
20	-4	16
16	-8	64
25	1	1
34	10	100
20	-4	16
28	4	16
31	7	49
24	0	0
27	3	9
15	-9	81
240		352

$10\overline{)240}$

$M_2 = 24$

SAMPLE OF DATA CARD

JOHN L. DOE M IA 59

_____Year of Grad.(23-24)

_____GPA of Major Sub.(25-27)

_____GPA of Non-Maj. Sub.(28-30)

_____Decile Ranking (31)

_____Gen. Ability Score (32-34)

Address		Place Garnett, Kansas	Date [illegible]
Next of kin Data — Name		Address Welda, Kansas	Relationship Parent
Admission data — H.S.	H.S.	Date of H.S. Grad. May 1958	Date Adm. To K.S.T.C. 8 Sep. 1958 — Type Adm. Uncond. — Adm. Class Fresh.
Degree Data — Title BSE		Date Conferred August 25, 1961	Major: Mathematics — Minor: English

NOTATIONS:
E By Extension
K By Correspondence
L On basis of exam
M On basis of Mil. Exp.
O Completed at later date
Q Completion of former incomplete
R Repeated or duplicated at later date
X For Graduate Credit
Y Not for Graduate Credit
Z Not applicable toward Bach. Degree
( ) Not counted toward any degree

Dep't	Course No.	Course Title	Sem. Credit	Gr.	Credit Points
		1st Sem. 1958-59			
Ma	131	College Algebra	3	B	
Ma	142	Trigonometry	2	B	
Ar	105	Art Exploration	2	C	
En	107	Freshman English IA	3	B	
Ch	122	Chemistry I	5	C	
Mp	101	Phys. Educ. I	1	B	
Ed	102	College Orientation	0	Cr	
		2nd Sem. 1958-59			
En	108W	Freshman English II	3	A	
Ma	251C	Calculus - Anal. Geometry	4	A	
Py	110C	Intro. to Psychology	3	A	
Bu	241B	Personal Finance	2	C	
En	225B	American Literature I	3	C	
Mp	103B	Phys. Educ. II	1	B	
		1st Sem. 1959-60			
Ma	252	Calculus & Anal. Geometry II	4	A	
En	355	Shakespeare	3	C	
En	226	American Literature II	2	C	
Bi	100	General Biology	3	A	
Sp	101	Fund. of Speech	3	C	
Ss	241	American Heritage I	2	C	
Mp	115	Tennis	½	B	
		For GPA	49½	2.79	143½ K
		For Degree	49½		
352400		SPRING 60			
MA	353B	CALC & ANALY GEOM III	40	A	160
MP	130A	VOLLEYBALL	05	B	015
MUA	226A	MUS EXPLORATION	20	B	060
EN	250B	ENGLISH LITERATURE I	30	B	090
MA	450	PROBABILITY & STATIST	30	B	090
SS	242B	OUR AMER HERITAGE II	20	C	040
PY	343C	TESTS & MEASURE	(30)	W	000
		2.89 640 0640			1850
		1st Summer Session, 1960			
Eng	352	English Romantic Poets	3	B	
Ed	333A	Principles of Secondary Education	3	B	
		2nd Summer Session, 1960			
Eng	251	English Literature II	3	B	
Eng	360	Advanced Composition Fiction	3	C	
		2.87 760 760	2		180

NT	Dep't	Course No.	Course Title	Sem. Credit	Gr.	Cr. Pts.
	352400		FALL 1960 61			
	MA	521	PROJECTIVE GEOMETRY	30	B	
	MP	111D	BADMINTON	05	C	01
	MP	110C	ARCHERY	5	C	01
	SO	102	INTRO TO SOCIOLOGY	30	B	09
	FL	103B	ELEMENTARY GERMAN	50	B	15
	MA	470	H S MATH FOR TEACHERS	20	A	08
	EN	362	ENGLISH GRAMMAR	20	A	08
			2.97 0920 0920			273
	352400		SPRING 60 61			
	MA	475	FUND CONCE TS OF MATH	30	A	12
	PY	343C	TESTS & MEASURE	30	A	12
	ED	334B	TCHNG IN T E SEC SCH	20	B	06
	MA	460	THE HISTORY OF MATH	20	B	06
	FL	104A	INTERMEDIATE GERMAN	50	B	15
	SS	490A	CONT AMERI AN SOCIETY	30	C	05
			3.00 1100 1100			330
			1st Summer Session, 1961			
	ED	491	Student Teaching (Sec.)	6	B	
			2nd Summer Session, 1961			
	ED	541 A	Prof. and Pub. Relations Tchr.	3	B	
	PSY	460	Educational Psychology	3	B	
	FL	250	Mythology	2	B	
			3.00 124 124			372

Recommended for the Kansas Teaching Certificate for Which Qualified

Director of Teacher Training Date

Not Valid as an Official Transcript Without Signature and College Seal. Student in Good standing Unless Otherwise Indicated.

Registrar, KSTC, Emporia, Kansas Date