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MCLAUGHLIN, HARRY KENNETH
APTITUDE, ATTRITION AND SENIOR LEVEL GRADE
POINT AVERAGE OF FRESHMEN ENTERING REGIONAL
AND COLUMBUS CAMPUSES OF THE OHIO STATE

THE OHIO STATE UNIVERSITY, PH.D., 1979
APTITUDE, ATTRITION AND SENIOR LEVEL GRADE POINT AVERAGE
OF FRESHMEN ENTERING REGIONAL AND COLUMBUS CAMPUSES
OF THE OHIO STATE UNIVERSITY: 1966 AND 1971

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
Harry Kenneth McLaughlin, B.S., M.A.

* * * * *

The Ohio State University
1979

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Faculty of Educational Administration
I wish to thank my family for their love, understanding and support. This study is dedicated to them.
This dissertation was developed while I was an administrative intern and written during my tenure as Assistant to the Dean and Director of The Ohio State University Marion Campus, C. Eugene Maynard. I wish to thank Mr. Maynard and the staff at the Marion Campus for their support and suggestions during the project.

During the development of the project several friends offered criticism and suggestions in the area of statistics and methodology. I thank Judy Aubrecht, Dan Christie, Terry Pettijohn, and Marvin Bratt for their contributions.

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Finally, the project would not have been completed without the support of my wife, Claire Schubel McLaughlin, who served as editor, typist, gentle persuader and hand-holder through the entire project. To my son Donald William, I am thankful that he was able to continue loving his much-absent Dad, who taught him his first four syllable word: dissertation.
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CHAPTER I

INTRODUCTION

The policy of lower division branch campus education in the state of Ohio and at The Ohio State University has been reassessed periodically. Various reasons have been given for the proposals to re-examine or eliminate branch campuses. At the state policy level the Ohio Board of Regents has suggested at times that particular campuses or the entire system be merged with local technical colleges as an efficiency measure. This recommendation was based on the perceived economic efficiency in operating one large institution instead of separate smaller technical colleges and branch campuses.

At The Ohio State University institutional studies have examined the two year campuses for the purpose of policy development and evaluation of organizational relationships. During the formative stages of this study the Provost of the University appointed a faculty review panel which reported on the functioning of the regional campuses and their relationship with the Columbus central campus.
In his letter to the review panel Provost Albert J. Kuhn suggested a mission for the panel:

In the interest of effective long range planning and in recognition of the maturity each campus is achieving, it is appropriate now that we take a look at the individual campus missions and the policies that have guided their development. Such a review should culminate in a clarification of the goals and mission of regional campuses and in possible recommendations for new policies and procedures.¹

The Regional Campus Review Panel reported in October of 1977. The essence of the report was that there are current and historical trends toward closer relationships to the Columbus campus and its academic departments. Since the report is the product of a faculty review panel, it emphasized, as might have been expected, faculty working conditions, inclusion of regional campuses in various governance systems in Columbus, tenure and promotion issues, administrative organization, and no mention of student attrition or regional campus-Columbus campus parity of the outcomes of education.² (David M. Scott) et al., Oct. 20, 1977, "Recommendations of the Regional Campus Review Panel to Provost Albert J. Kuhn."

¹Albert J. Kuhn, Letter to the members of the Regional Campus Review Panel, Columbus, Ohio, 1976.

The consideration of policy changes, especially at the state level, seems to have occurred in the absence of data concerning the effectiveness of the branch campus as a vehicle for lower division education. This study seeks to secure data which could be utilized in the planning and decision-making concerning two year campuses. The study will focus on two freshman classes of The Ohio State University.

Four groups of students entering the University as new first quarter freshmen will be compared on several variables. Students entering the University at the Columbus campus during the Fall quarter of 1966 and 1971 and students entering regional campuses during 1966 and 1971 constitute the four groups. The variables to be studied are American College Test composite scores, attrition, and senior year grade point average.

BACKGROUND TO THE PROBLEM

State Policy for Two Year Campuses in Ohio

As part of the effort to fulfill the promise of Ohio's commitment to open door higher education, state university branch campuses were established both before and after World War II. The campuses were operated as branches of state universities and represented the initial effort of the state to provide de-centralized opportunities for lower division
baccalaureate education. As of 1966 there were 34 branches or academic centers of 6 state universities. In 1971 there were only 29 branches or academic centers of 5 universities.

The existing law in the state of Ohio mandates that all public universities are obliged to admit every student who has graduated from the twelfth grade who applies for admission. In general, the development of branch campuses and academic centers has been supported as a way of relieving enrollment pressure on central campuses of state universities as well as for economic reasons on the part of those unable to attend the central campus.

Initially the institutions were housed in local high schools, offering late afternoon and evening instruction on the introductory and lower division level. The branches were seen as safety valves for enrollments in excess of the capacity of other state institutions. A primary reason for their establishment was the "veterans' bulge" of the post-war period. In addition, these branches were to serve as necessary adjuncts to state level programs for the expansion

---

3 Ohio Board of Regents, Master Plan for State Policy in Higher Education, (Columbus, Ohio: The Ohio Board of Regents, 1966), p. 130.


5 Ohio Board of Regents, Master Plan, 1966, pp. 32-34, 131-134.
and improvement of the elementary school teaching force.  

The campuses, as part-time academic centers, had no full-time faculty. Instructional personnel were drawn from University central campus faculty members teaching on an overload basis, from graduate students, and from local educators with graduate degrees. No state subsidy support was available until 1959 and regular support of all branch instruction was available only after 1963. Branch campuses were given the permanence of campus facilities in the mid-sixties when funds were appropriated by the Ohio General Assembly for buildings.

Based on these developments the Ohio Board of Regents, in its 1966 Master Plan, defined branch campuses as a separate campus of a state university offering two year lower division programs on a full-time basis. The programs were to be similar to central campus lower division programs and allowed for transfer into appropriate upper division degree programs upon completion by a student. 

By 1971 the Board of Regents revised its support of two year campuses in the state. The Regents, in a draft of the 1971 Master Plan for State Policy in Higher Education, recommended the elimination of two year campuses of state universities and two year technical colleges and institutes.

---

6 Ibid., p. 130.

7 Ibid., pp. 130-132.
In their place "state community and technical colleges" would be established on 25 sites. The main reasons given for this decision were the management efficiency of operating one campus in situations in which a two year technical school and a branch campus existed side by side, the lack of emphasis on community service on the part of some universities, and the need to support technical education.

The 1971 Master Plan as approved in the legislature did not include the section on two year campus reorganization. However, the prospect of such change in state policy in higher education led James M. Vaughn to study the characteristics and attrition pattern of regional campuses in hopes of proving these campuses to be different from community colleges. (This study will be reviewed later in the chapter.)

In its most recent five year plan the Board eliminated any reference to comprehensive re-evaluation of the efficiency of the current lower division institutional arrangement. However, the plan does specify that any change in institutional organization in the two year campus system should be in the direction of the establishment of state

---

9Ibid., pp. e,f.
general and technical colleges in place of two year branch campuses and technical colleges which exist on the same site.10

In other documents the Board has suggested that smaller campuses and technical colleges consider merging. "In two locations, there are two separate institutions enrolling fewer than 500 FTE. It would be reasonable in each instance for the principals involved to consider at least some administrative consolidation and perhaps actual institutional consolidation."11

The Regional Campuses of The Ohio State University

The regional campuses of The Ohio State University are part of a peculiar institution. With a mission in research and graduate studies, The Ohio State University bears a major burden in Ohio for graduate and professional education and research productivity.12 According to the Ohio Board of Regents:

"It is in that mission of the University to foster graduate study at the doctoral level and graduate professional study in such fields as medicine,


12Ohio Board of Regents, Master Plan, 1971, p. 144.
dentistry and law, that the University can make its primary contribution to the state of Ohio."

The University may be unique among major research institutions in the United States in its longstanding open door undergraduate admissions policy. All students who are graduates of high schools in the state are eligible for admission. Fall quarter admissions for the central (Columbus) campus are handled on a "rolling" basis. In-state students are accepted as applications are received; all students applying after February or March of the preceding year are put on a waiting list or rejected regardless of qualifications. The effect of this is to make The Ohio State University undergraduate student body a self-selected rather than a university-selected student body.

Admissions to regional campuses are administered in a similar manner. The major difference between central campus and regional campus admissions is that the regional campuses have not closed admissions until the start of the Fall quarter of a given year. The reason for this can be assumed to be that the regional campuses have never been at absolute capacity. It should be noted that the commuter-oriented nature of the regional campuses allows for more flexibility because of the lack of pressure to house students which prevails on the central campus. Therefore, the

\[13\] Ibid.
only logical reason for closing admissions to a regional campus would be lack of physical space or the lack of faculty. The lower division courses taught at regional campuses could be staffed by generalists in a subject area. Introductory courses that new students take would, therefore, be less difficult to staff than more specialized courses. In addition, the availability of graduate student instructors and "overload" appointments of Columbus campus faculty members help relieve any last minute course enrollment pressure.

Historical Development of the Regional Campuses of OSU

The University established its branch campuses in order to provide low-cost, high quality instruction on the lower division level which was accessible to the service area of its various branches. At the outset, in each case, the programs were heavily dependent on local support services including local high schools (for facilities) and local libraries (for instructional support).

Initial course offerings were limited because of enrollment. As enrollment grew the selection of courses was expanded in order to attempt to duplicate the general baccalaureate offerings of the Columbus campus. By offering such courses the University provided access to the quality and variety of its programs at minimal cost to individual students living at home.
The first regional campuses were opened at Newark and Marion in 1957 as academic centers. These were followed by Mansfield in 1958 and Lima in 1960. Initially all campuses operated in local high schools with late afternoon and evening scheduling during the regular academic year.

By the mid-sixties planning or construction of permanent facilities at all campuses was underway. New permanent facilities were opened at Lima and Mansfield during the academic year 1966-67. Permanent facilities at Newark and Marion were opened during the 1967-68.

The building of facilities at the regional campuses was paralleled in the growth and development of regional campus faculties. Between 1957 and the time of the development of facilities, the campuses used main campus faculty on an overload basis, graduate students and high school faculty members with Masters degrees to fill faculty positions. A recent survey of the regional campus directors conducted by the writer records the change in the size, qualifications, and rank of the faculty. Table 1 shows the growth in full-time Fall quarter faculty over the period 1966-1976. Growth in size at Mansfield and Lima, to a large extent, could be explained by the early establishment of physical plants; the faculties at these two locations show higher full-time totals in the early years.
The professional development of the faculty members as a group at each campus is more striking. The percentage of faculty members at each campus with doctoral degrees has risen steadily. See Table 2.

The University, in many of its departments, limits the membership of the regular faculty (ranks Assistant Professor and above) to those with doctoral degrees. The membership in ranks of the faculties parallels the degree achievement levels of the faculty members. As the regional campus faculties increase in professional qualifications the membership in ranks for Fall quarter full-time faculty shifted toward the regular faculty ranks of Assistant, Associate, and Full Professor. See Table 3.
TABLE 1
FULL-TIME AND PART-TIME FACULTY APPOINTED AT
OHIO STATE UNIVERSITY REGIONAL CAMPUSES
DURING SELECTED FALL QUARTERS

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<thead>
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<td>11</td>
<td>48</td>
<td>8</td>
<td>43</td>
<td>24</td>
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<tr>
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<td>13</td>
<td>44</td>
<td>15</td>
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<td>24</td>
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<tr>
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<td>25</td>
<td>29</td>
<td>17</td>
<td></td>
<td></td>
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<tr>
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</table>

Source of data: Survey of the Directors of The Ohio State University Regional Campuses, October 1976.

1Newark Campus did not respond
TABLE 2

HIGHEST DEGREE ATTAINMENT FOR FULL-TIME FACULTY MEMBERS AT REGIONAL CAMPUSES OF OHIO STATE UNIVERSITY DURING SELECTED FALL QUARTERS

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<thead>
<tr>
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<td>P</td>
<td>M</td>
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<td>10</td>
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<td>1</td>
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</tr>
<tr>
<td>Newark</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

D - Doctoral (Ph.D., Ed.D., etc.)  
M - Masters (M.A. M.S.)  
P - Professional (MFA, MLS. J.D., etc.)  
B - Baccalaureate

Source of data: Survey of the Directors of The Ohio State University Regional Campuses, October, 1976.

¹Newark Campus did not respond
<table>
<thead>
<tr>
<th>Campus</th>
<th>1966</th>
<th></th>
<th>1971</th>
<th></th>
<th>1976</th>
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<td>Asst</td>
<td>Instr</td>
<td>Prof</td>
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</tr>
<tr>
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<td>1</td>
<td>8</td>
<td>16</td>
<td>3</td>
<td>0</td>
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<tr>
<td>Mansfield</td>
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Source of data: Survey of the Directors of The Ohio State University
Regional Campuses, October, 1976.

¹Newark Campus did not respond
Research Concerning the Regional Campuses

Two early studies of the campuses relate to the need for the proposed study. Brewer, in a small but intricate study of the regional campuses, compared students transferring from regional campuses of The Ohio State University with students continually enrolled at the Columbus campus. Her study compared a group of regional campus students transferring after the sixth quarter of attendance at a regional campus in Fall quarter 1966 with students having completed six quarters at the Columbus campus at that time. The study compared the performance of these groups over three quarters of the academic year 1966-1967 (Fall 1966, Winter 1967, and Spring 1967).

Brewer found significant differences between groups in a comparison of grade point averages. The Columbus campus group had a significantly higher mean grade point average than the regional campuses group after the sixth and seventh quarter.\(^\text{14}\) The pattern of difference between groups showed a decrease in the gap between regional campus and Columbus students over the three quarters. By the third quarter the grade point average difference was no longer significant, although the grade point average of Columbus students

remained higher. This supported the conclusion that "transfer shock" existed for students transferring from regional campuses.\textsuperscript{15} In addition, Brewer found a higher attrition rate for the transfer group within the year.\textsuperscript{16}

A potentially significant finding of the Brewer study was that high school rank and American College Test scores were not significantly related as has been traditionally expected. While ACT scores and grade point average population norms of Columbus campus students were higher, the mean high school rank of these students was lower than that of regional campus transfers. Brewer explained this by speculating about the size and quality of high schools which regional campus students attend.\textsuperscript{17}

The group of students Brewer studied were those who were selected based on conditions which either do not exist now or may have influenced the findings of the research in the following ways:

1. The group of regional campus students studied by Brewer entered the regional campuses under conditions which no longer exist. These students attended the late afternoon and evening academic centers that existed prior to the

\textsuperscript{15} Ibid.
\textsuperscript{16} Ibid., p. 32.
\textsuperscript{17} Ibid., p. 33.
building of campus sites and the corresponding development of resident full-time faculties.

2. Brewer studied only students who had completed two years of study toward a degree. Her main finding was that transfer shock exists between regional campuses and the Columbus campus of the University. This leaves open questions about the academic characteristics of incoming student bodies of regional campuses may differ in this regard from Columbus students.

3. Related to the questions about the characteristics of entering students are questions concerning attrition patterns in the respective campus groups. Brewer studied those who had successfully completed two years of study at Columbus and the regional campuses. Unanswered questions remained concerning overall attrition patterns of the groups.

James M. Vaughn in A Longitudinal Study of the Retention, Attrition, and Transfer of Students at the Regional Campuses of The Ohio State University (1971) examined the demographic and educational characteristics and the undergraduate educational careers of the entering class of new first quarter freshman students of The Ohio State University in 1966. Vaughn compared regional campus students and their undergraduate careers and characteristics with a sample of Columbus campus students and with two and four year college national norms.
Vaughn found that characteristics varied between regional campus students and Columbus campus students. Regional campus students were in general older than Columbus campus students, with 28.5 per cent having birthdates in 1947 or earlier compared with 14.0 per cent for the Columbus campus.\textsuperscript{18} Regional campuses were also more heavily dominated by males in the population with 64.5 per cent compared to 60.9 per cent for the Columbus campus.

Vaughn also found that regional campus students differed from both Columbus campus students and two year college students in social and geographical background and major influences in selecting a college. Regional campus students fell between the average for two year and the average for four year institutions in percentage expecting to receive at least a bachelor's degree and in academic ability as measured by ACT composite score.\textsuperscript{19}

Regional campus students were found to have a much lower institutional retention rate five years after entry than Columbus campus students. Fourteen percent had graduated and 14 per cent were currently enrolled in the regional


\textsuperscript{19}Ibid., p. 115.
campus sample for a total retention rate of 28 per cent. The Columbus campus sample produced a 36 per cent graduation rate and 16 per cent currently enrolled, totalling a 52 per cent retention rate. The gap in retention rates is 24 per cent in favor of the Columbus campus sample. The regional campus percentages were much higher in academic dismissals (38 per cent to 24 per cent for Columbus campus) and failure to re-enroll (24 per cent to 14 per cent for Columbus campus students). Rates of withdrawal were equal for both groups (10 per cent).

Adjusted attrition and retention rates include sample survey data on students considered institutional attritions but who were actually transfers to other higher education institutions. Regional campus adjusted retention percentages show 23 per cent currently enrolled and an 18 per cent graduation rate for a total retention in higher education of 41 per cent. The adjusted Columbus campus retention rate was 67 per cent (25 per cent currently enrolled, 42 per cent graduated). Columbus campus ACT decile groups and high school rank groups showed higher rates of retention than similar groups of regional campus groups. This led Vaughn to conclude that explanation of differences in

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20Ibid., p. 116.
21Ibid., p. 117.
retention and attrition rates must be found in the differences in academic programs, social background of the students, or non-academic institutional variables. 22

Vaughn's study also established that 73 per cent of all institutional attritions occurred before the sophomore year (52 per cent of the class) and 93 per cent before the junior year. The freshman year attrition rate was found to be close to that expected in two year colleges but far above attrition rates in four year schools. 23

Transfers to the Columbus campus were completed by 34 per cent of the regional campus sample. The most common point of transfer was found to be at the end of six quarters. 24

Vaughn considered the entering class of 1966 to be important subjects for study because this class was the first to experience as regional campus students a time period of study at a permanent regional campus facility. 25 This allowed for full-time day scheduling of classes. In effect this group of students was the first to experience a traditional collegiate atmosphere at OSU regional campuses.

22Ibid., p. 124.
23Ibid., p. 118.
24Ibid., p. 119.
The study proposed here would likewise center on a group of students unique in the history of the University. The entering class of 1971 on the regional campuses of OSU is the first group of students to enter the University under all of the following several conditions:

1. Full load, daytime scheduling was possible.
2. Full-time regional campus-based faculty were available in most departments.
3. All students began programs in permanent Ohio State University campus facilities.
4. Technical colleges or institutes operated on all campuses for the first time, introducing an alternative type of education for some students.
5. Expansion of programs at regional campuses, enabling students to remain at a regional campus longer in a given course of study, was progressing.

The above conditions contributed to the uniqueness of the entering class of 1971. This uniqueness is relevant to the proposed study because the conditions outlined are permanent changes in the character of regional campus education. The changes represent the culmination of development of regional campus baccalaureate programming. The investigator has no knowledge of plans to alter conditions on regional campuses other than the continuation and development of the trends outlined above. Because of this the
study proposed of the entering class of 1971 may indicate future trends in the retention and attrition of students at regional campuses.

There is some indication that the characteristics of regional campus students have changed in recent years. The focus of the Vaughn study was on institutional retention and attrition. At the time of Vaughn's study the class of 1966 had a potential graduation percentage (students currently enrolled plus students graduated) of 33.8 per cent at the Marion Campus. In a recent follow-up study concerning the entering class of 1969 at the Marion Campus the writer found a potential class graduation percentage of 43.4 per cent. This represents increased retention at Ohio State Marion Campus of 9.6 per cent over the entering class three years before. These figures compare with a retention rate of 52.3 per cent for a sample of first quarter freshmen on the Columbus campus in the Fall of 1966.

Similarly, the patterns of attrition among students appears to have changed during the period between these two classes. Vaughn found an institutional attrition rate for Ohio State Marion Campus of 66.2 per cent (attrition includes all those not currently enrolled at Ohio State at the

26Ibid., p. 87.
The entering class of 1969 produced a 56.6 per cent attrition rate for Marion Campus beginning students.

The rate of dismissal within these groups has fallen dramatically. Vaughn found a dismissal rate of 37.7 per cent for entering Marion students in 1966. The author in his recent study found a dismissal rate 7.7 per cent for entering Marion students.

**PROBLEM STATEMENT**

The study will examine changes in the aptitude and attrition pattern for Ohio State University regional and Columbus campus students entering these campuses as new freshmen in the years 1966 and 1971. Four groups of subjects are included in the study: first quarter freshmen entering the regional campuses in 1966, first quarter freshmen entering regional campuses in 1971, first quarter freshmen entering Columbus campus in 1966, and first quarter freshmen entering Columbus campus in 1971. The following four problem areas will be investigated:

I. A. Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State

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\[27\text{Ibid.}\]
University regional campuses during Fall quarter 1966 and those entering Fall Quarter 1971?

B. Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State University at the Columbus campus during Fall quarter 1966 and those entering in Fall quarter 1971?

C. Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State University during Fall quarter 1971 at the Columbus campus and those entering regional campuses in 1971?

II. What is the relationship between the rates of the campus entry groups included in the study (Columbus 1966, Columbus 1971, regional campus 1966, and regional campus 1971)?

III. What is the relationship between the groups of students defined as attritions and those defined as retentions at The Ohio State University when compared on ACT composite score measures for each campus-year of entry described in the study?

IV. What are the independent and combined effects of ACT composite score and campus and year of entry on the senior level grade point average of students in the study who graduated from the University?
PROCEDURE AND METHODOLOGY

The design chosen for this dissertation is that of a descriptive study. Sax defines descriptive research as "the collection of data for the purpose of describing conditions as they exist".\(^{28}\) A particular example of this type of research is the case study, "any relatively detailed analysis of a single person, event, institution or community".\(^{29}\) This parallels Guba's definition of a study. The condition when internal validity is controlled through randomness and other controls and external validity is not an issue.\(^{30}\)

The research proposed in this paper meets these conditions as an in-depth analysis of factors which describe conditions at The Ohio State University over time. The research will meet the criterion of internal validity through random selection of subjects. External validity is not an issue in this case as no attempt will be made to generalize the findings to other institutions.


\(^{29}\)Ibid., pp. 288-289.

Sax outlines four common uses for case study research, two of which apply to this case. The first, and primary use in this case, is for the development of hypotheses for further research. Secondly, the study was developed because the particular conditions and potential of the research are interesting and useful.\textsuperscript{31} The uses of institutional research in general are summarized in the two purposes.

**Population and Sample Selection**--The populations to be examined in this study are the new first quarter freshmen classes of The Ohio State University entering in Fall quarter 1966 and 1971. All students who were admitted to the University paid instructional and general fees, registered for classes, and attended the University until the fourteenth day of classes will be included in the universe. Only students who meet these criteria are considered to be officially enrolled for state subsidy purposes. For any student attending the University beyond the fourteenth day of classes in any quarter a transcript is prepared and on file in the Office of Records. The population will be limited to those who meet this criterion because only those students will have a complete data file for the purposes of this study.

The selection of the members of the population will be carried out using orientation testing and scheduling lists prepared for use by University personnel in scheduling students who will be attending the University. The lists include the name of each prospective student and data concerning the student's academic ability. American College Test scores, the student's high school rank (if available) and University placement tests scores are included. All entering freshmen included in this study were required to attend a testing session and would be included in these lists. The campus of each student is indicated by code on the testing report.

The term "new first quarter freshman" is used by the University to describe students entering the University for the first time with no prior experience in post-secondary education. Testing lists also include students who transfer from other institutions and forms of higher education. This study will be limited to new first quarter freshmen.

The population of regional campus new first quarter freshmen in 1966 and 1971 will be isolated from testing lists for those quarters. This population will then be randomly sampled, using a table of random numbers, in order to obtain a population of manageable size. Sample sizes for each group included in the study will be 200. The regional
campus sample will be stratified by campus with 50 students entering at each regional campus included in each sample.

After the sample of regional campus students for each year is determined, a control group will be chosen of equivalent size from the testing lists of entering students at the Columbus campus for each Fall quarter to be studied (1966, 1971). The same criteria for inclusion in the study will be used for Columbus campus students as outlined above. The purpose of the control group is to determine whether any change in the population parameters of regional campus students in ACT scores or attrition is due to change in the University in general or only for regional campus students.

Data Collection

The data to be collected in this study will be the ACT composite score, institutional retention or attrition of every member of the study population, and senior level grade point average. Data will be recorded by both student number and name so that information may be searched in files which exist in both alphabetical and numerical identification forms. Each student's data file will also include the campus and year in which he/she entered the University. ACT composite scores will be recorded as standard scores. Attrition-retention information will be recorded by categories: Graduated (for those who have received baccalaureate degrees from the University), currently enrolled (for those
continuing to attend the University as students in a degree-granting college), and institutional attrition (for those no longer attending the University or attending through the Division of Continuing Education).

The data will be located in the Office of Evaluation and Testing for the analysis of ACT scores. The data for attrition and senior grade point average will be found in the office of Records transcript vault. Every student attending the University long enough to generate an academic record is represented in the transcript file of the Office of Records. Each student-subject's file will be located and assessed according to the categories outlined above.

In order to meet federal requirements of research on student records as outlined in the Family Educational Rights and Privacy Act, the confidentiality of data collected in the study will be guaranteed. Under the regulations developed for the Act, research may be carried out only if the data is kept confidential in any form in which the identity of individuals may be discovered. Therefore, only data in aggregate form will be discussed in the study. As a further control for confidentiality of records, student data files will be assigned numbers which will substitute for the student name and number as soon as all data information is collected. The number assigned will have no relationship to name or student number of the subject. All identifiable data will then be destroyed.
The data analysis procedures will be directly related to the questions included in the problem statement. Appropriate statistical analysis procedures will be applied to answer these questions.

Data Analysis

Statistical analysis for the project will be carried out using four statistics. Each problem involves characteristics in the data which require a particular statistical analysis. In the absence of hypotheses and in the interest of clarity, actual significance levels will be reported for each analysis.

Problem I, the analysis of changes in ACT composite scores, involves two independent variables in combination with each other: Year (1966, 1971) and campus (regional campus, Columbus campus). The dependent variable, ACT composite score, will be measured at only one time, the point of the student's entry into the University. A factorial design was chosen with two factors for this analysis.32

Factorial analysis of variance analyzes the independent and interactive effects of two or more independent variables on a dependent variable.33 In this case factorial analysis


33Kerlinger, Foundations, p. 245.
will allow for control of year and campus classifications while focusing on the dependent variable, ACT composite scores. A major advantage of factorial analysis is the ability to assess interactive effects of independent variables on the dependent variable. Interactions between cells in the design are the focus of the analysis.

The solution of the analysis of variance problem will describe the main and interactive effects of the independent variables. A significant interaction will describe a situation in which one cell of the design is significantly different from one other cell. Specific cells will not be described by the interaction measure. Post hoc analysis in the form of multiple pairwise comparison of cells will be necessary to answer the research questions specified within the problem statement.

The factors to be analyzed in the analysis are considered to be fixed, a classification which describes those factors which are arbitrarily chosen by the investigator or occur as natural categories. In this case the factors, year and campus of entry, were used because of their natural character in the non-experimental use of the design. A

fixed effect or linear hypothesis model for ANOVA programs is specified under these conditions.\textsuperscript{35}

In Problem II, the relationship between attrition in the student population and campus and year of entry is examined. Attrition is a criterion referenced variable. Use of any other form of analysis, such as quarter hours or quarters completed, might introduce statistical variation which could be tested but would sacrifice the specificity of the criterion attrition.

The statistic chosen for analysis in this problem is the Pearson chi-square test of independence. Chi-square is specifically suited to the analysis of true nominal level data which represent independent events. The data in this problem represent a series of independent events. The analysis will test the null hypothesis that the relationships shown in the chi-square contingency table are not significantly different from random probability.

The problem meets the following specific assumptions of the x statistic outlined by Hays in \textit{Statistics for the Social Sciences}.\textsuperscript{36}


1. Each observation should be independent of every other observation.

2. The joint-frequency table used in chi-square tests must be complete in that each observation must represent one and only one joint event possibility. Thus every observation must qualify for one and only one row and one and only one column, and one and only one cell in the contingency table.

Problem III examines the relationship between the attrition of students in each campus-year environment and ACT composite scores. ACT scores are assumed to be normally distributed at each campus during each year and in the general population. Attrition, as discussed previously, is a nominal variable. Although the distinction between attrition and retention is being made on a nominal level we must note an underlying assumption that achievement levels will vary within the two categories. Students have varying levels of success within both categories in terms of grade point average, number of quarters completed (either before attrition or in time required to attain a degree).

In the case of a dichotomized, but normally distributed, variable examined for correlation with an interval level variable, a biserial $r$ is considered to be adequate. Correlation will be computed for ACT composite scores of attritions and retentions for each of the four cells in the
primary design of the study, students entering: regional campuses 1966 and 1971 and Columbus 1966 and 1971.\textsuperscript{37}

The information yielded in this analysis will describe correlations between ability level (as described by ACT scores) of students and institutional attrition. The correlation is computed between the attrition and retention groups for each campus and is based in ACT scores. The specified null hypothesis for a biserial $r$ is that there is no difference between the two dichotomized groups on the continuous variable. In such a case biserial $r$ will equal zero. In alternative case, the larger the difference between means on the continuous variable the larger the correlation.\textsuperscript{38}

The statistical methodology for question 4, the analysis of the predictive nature of campus and year of entry and ACT composite scores on senior grade point average, will require the use of multiple regression analysis. ACT scores, normally distributed interval level data, will be used as one independent variable. Campus and year of entry will be coded as three dummy variables. Dummy variables are created in order to include categorical information in a regression equation in the form of vectors. Three vectors will be


\textsuperscript{38}Ibid., p. 294.
used in order to conform to the rule of K-1 dummy variables as outlined by Nie et al. and Kerlinger and Pedhazur. The use of multiple regression analysis in situations involving both continuous and categorical or nominal variables involves a special case of the method which includes dummy variables.

The researcher seeks to determine whether knowledge of group membership will significantly reduce errors of prediction as compared to errors made when group membership is not specified.

In this case we will attempt to explain the prediction of senior level grade point average using ACT composite scores, adding campus of entry groups in order to estimate the predictive effect of campus of entry on senior level GPA.

Regression equations occur in the form of "slope-y intercept" equations in matrix algebra (y=bx+a). The analysis will involve the plotting of four regression vectors representing the four campus/year of entry groups. Vector will be compared in terms of slope to ascertain the effect

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39Nie et al., Statistical Package, p. 374.


41Ibid., pp. 102-103.
of the continuous variable (ACT). Parallel regression lines indicate similar effect of the continuous variable on each group. Significance tests will be calculated which will determine whether any difference in b or slope co-efficients is due to chance.\textsuperscript{42} Difference in the effect of "a" co-efficients or intercepts will be determined by the use of statistics which will show difference between and among the four intercepts. The intercepts are defined by the particular characteristics of the dummy variable groups determined by the campus/year classification.\textsuperscript{43}

The specific information sought in this analysis will relate to the predictive nature of knowledge of campus/year entry group and ACT composite score on senior level grade point average. Within the limitations of the data generated by the study we will seek to determine the separate and combined predictive nature of the two independent variables on the dependent variables, senior level grade point average. The specific statistics of interest will be the regression equations involved and partial correlation scores for the two independent variables.

\textsuperscript{42}Ibid., pp. 232-233.
\textsuperscript{43} Ibid., pp. 237-238.
DEFINITIONS

American College Test--A nationally standardized test of academic aptitude. The composite score is an average standard score of the four tests (English, mathematics, social studies, and natural sciences) for each student. The mean composite score for college-bound students is 19 with a minimum of 1 and maximum of 35 with a standard error of 1.44.

Attrition--general term used in this work to refer to any discontinuation of attendance in higher education before a baccalaureate degree, used interchangeably in the literature with dropout.

Attrition Rate--the percentage of those counted as attritions.

Branch Campus--this category includes all efforts by institutions to offer off-campus educational programs on the undergraduate level at permanent campuses.

Institutional Attrition--any student leaving an institution for any reason on a permanent basis before obtaining a baccalaureate degree.

Regional Campus--refers to the four regional campuses of The Ohio State University located at Lima, Mansfield, Marion, 

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and Newark, Ohio. The campuses offer two years of lower division instruction in baccalaureate programs for most Ohio State University major programs. Baccalaureate degrees in most areas may be earned only at the Columbus campus.

Retention—refers to those students in groups to be studied graduated with a baccalaureate degree or currently enrolled at Ohio State University or one of its regional campuses or at another institution of higher education.

Grade Point Average—a numerical ratio of the sum of quality points earned for each credit hour attempted to the total number of credit hours attempted. Limited to courses graded on the scale A=4.0, B=3.0, C=2.0, D=1.0 and E=0.0.

Senior Level—all quarter hours earned by a student in a degree program after the quarter in which he earns his one hundred thirty-fifth hour. Defined by University standards for Rank IV or senior level.

SIGNIFICANCE OF THE STUDY

In background and related literature no studies were found which discuss the characteristics and attrition pattern of a particular institution or group of institutions over time. This dissertation will discuss a situation in which the ability level of students and subsequent educational outcomes of those students will be outlined for two periods five years apart.
During the five year interval between the entry of groups, the development of campus facilities and faculties at regional campuses accelerated. Studies outlined in chapter two indicate that environment and college characteristics have an effect on drawing power for able students and ultimately on attrition. On an exploratory level this work will discuss one institution in which development of campuses within a system has demonstrably occurred.

This aspect of the research expands its significance beyond that of an institutional research project.

ASSUMPTIONS AND LIMITATIONS

1. The study will be limited to students of the five baccalaureate degree campuses of The Ohio State University (Columbus, Lima, Mansfield, Marion, and Newark) entering as freshmen in Fall 1971 and Fall 1966.

2. It is assumed that in the years 1966 and 1971 no extraneous factors influenced the attractiveness of the University's campuses to students except those discussed in the study.

3. The study will be limited in discussions of attrition and retention to institutional attrition and retention.

4. It is assumed that this study will be of value in the planning and administration of regional campus programs.
ORGANIZATION OF THE STUDY

The study will be organized into four chapters. The first chapter included background to the problem, problem statement, methodology, and general introductory material. Chapter two will consist of a review of related literature and research. Chapter three will be a report of findings and chapter four will contain a summary, conclusions and recommendations.
CHAPTER II

REVIEW OF RELATED LITERATURE AND RESEARCH

The background to the problem and problem statement included in Chapter one should be viewed in light of the theoretical and experimental scholarship which focus on the problem area.

Studies were included in this review for the following reasons. First, a theoretical background for the research was sought. Second, an emphasis was developed to bring existing non-theoretical research into a context which would allow readers to see the developmental trends in this research area.

REGIONAL AND BRANCH CAMPUSES

A comprehensive review of the research concerning regional or branch campuses of state universities similar to The Ohio State University resulted in the three studies outlined in this section. In addition, Henry W. Hixson, who has conducted a survey of directors and deans of branch and regional campuses for several years, suggested several persons who might have knowledge of research in regional and
branch campuses. Each of these individuals was contacted, informed of the proposed research, and asked to supply additional information or citations.

The search for additional literature was hampered by the fact that this research area has not been delineated by the two major sources identified as having useful information for reviewers of literature. Dissertation Abstracts and the ERIC system were searched under several title and subject headings with little success. This information is offered only because it explains, to some extent as both cause and effect, the lack of research concerning branch and regional campuses.

Several branch campus systems were identified as being similar to the regional campuses of The Ohio State University. During the years that were studied the University of Wisconsin Center system was similar although it now is organized separately from the Madison campus. In addition, The Pennsylvania State University Commonwealth Campuses, branch campuses at Ohio University, and certain campuses in the University of South Carolina system were primary targets in the literature review. The following studies at campuses

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1Henry W. Hixson, then Assistant to the Director, The Ohio State University Mansfield Campus, personal interview, August 1976.
James Hale Gordon studied the entering class for Fall quarter 1966 of Ohio University at each of the five campuses of the University. Gordon reported on the entry characteristics of each campus and the attrition and retention pattern over a period of fifteen months.

Six hundred ninety-two students entered the branch campuses of Ohio University at Belmont County, Chillicothe, Portsmouth, and Zanesville. These students were compared with 600 students entering the Athens campus on the following measures: Strong Vocational Interest Blank, high school rank, and grade point average.

Male and female students at the Athens campus scored significantly higher on all sub-test scores of the ACT assessment than did male and female students at each of the "new" (Gordon's term) campuses.²

During the relatively short time covered by the study, 69 students transferred to the Athens campus from a new campus. Of these students, 24 showed no decrease in grade point average or "transfer shock". Forty-five students experienced some decrease in grade point average in the first grading period at Athens. Of the 45 experiencing

transfer shock, 37 did not recover in succeeding quarters.³

Gordon's study covered only a fifteen month period and established only that branch campus students had different characteristics than Athens students with respect to prior academic achievement and that this gap in achievement continued.

Albert J. Mikula's dissertation, "A Study of the Characteristics and Academic Performances of Regional Campus Transfer Students", looked at transfer students entering the Oxford, Ohio, campus of Miami University after completing lower division academic requirements at the Hamilton and Middletown campuses. Only full-time students were included in the study. The transfer students were compared to an equally numbered group of "native" students to the Miami Oxford campus.

Mikula's results showed that there was no significant measure of transfer shock for Miami regional campus students after transfer to Oxford. The mean grade point average in the three quarters post-transfer was slightly below that of the three pre-transfer quarters but this difference was not significant.⁴ Oxford Campus students who entered in Fall

³Ibid., p. 120.

quarter 1968 as freshmen were compared to regional campus students transferring campuses before Fall quarter 1970 with respect to grades in the three quarters post-transfer, ACT scores and high school grades. Students who began baccalaureate programs at Oxford in 1968 scored significantly higher on grade point average earned in the Fall, Winter, and Spring quarters of 1970-1971 than students transferring to Oxford from regional campuses for Fall quarter 1970. Significant differences were also found between the students beginning at Oxford and those transferring from regional campuses on ACT composite scores and on each of the four sub-tests. Differences in ACT scores were mirrored in the high school grades of the transfer group and the Oxford group. In all of the major academic course groups (mathematics, English, natural sciences, and social studies) students who entered at Oxford scored significantly higher when compared to transfer students on grade point average.

Mikula's conclusions and recommendations may be open to question on methodological and logical grounds. Mikula concludes that transfer students should expect to receive lower grades after transfer which directly conflicts with his discussion of the results of the analysis of the

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5Ibid., pp. 109-110.
pre-transfer/post-transfer comparison of grades. Comparisons of mean scores of grade point averages of students before and after transfer yielded a slight difference which would seem to indicate a slight transfer shock; however, the observed difference was calculated as being not statistically significant at the .05 level.

Mikula recommends that the recruitment of faculty for Miami's regional campuses be oriented toward developing a teaching faculty rather than a research-oriented faculty. This recommendation is not supported specifically by his research. Blau and Astin, reviewed at length in this chapter, indicate that the academic reputation and ability level of faculty members is a major factor in the recruitment and retention of students.

Finally, Mikula's research can be questioned on methodological grounds. In hypotheses one through twelve, T-tests were conducted. Many of these T-tests involve

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6Ibid., pp. 105, 106, 138.
7Ibid., pp. 105-106.
8Ibid., p. 140.
multiple comparisons of the same data. The use of multiple T-tests results in the increase in probability of research error. The significance level for these T-tests was reported at the .05 level. Because of the large number of tests performed it is likely that these significance levels, as error estimates, are artificially low. In addition to the above methodological error, it appears that the study also suffers from a lack of parallelism. While Oxford "native" group students were described as having entered in 1968 for Fall quarter, transfer students were only chosen because of their transfer in 1970 with upper division status. The criterion for selection differed for the two groups of students studied.

SELECTION, REPUTATION, AND THE HIERARCHY OF INSTITUTIONS

Burton R. Clark in "College Image and Student Selection" outlines sociological concepts concerning the attractiveness of an institution. Clark notes that attraction by public image may be equivalent to selection by an admissions office. The attraction is inherently more resistant to change than admissions office standards. Students

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determine, based on the history and environment of the institution, whether application to a particular college is a worthwhile exercise. As noted earlier, since The Ohio State University is an open-door institution, its entering student body could be considered to be entirely self-selected.

Blau (The Organization of Academic Work) and Astin (Predicting Academic Performance in College) support Clark in the analysis of drawing power and the selectivity of students.

Blau found that for more able students the reputation and hence the attractiveness of an institution was influenced by its affluence, including faculty salary levels, faculty qualifications, and differentiation into departments. The abilities of the total incoming student body were found to be influenced by the reputation among more able students and other factors: location outside the South, affluence and qualifications of faculty.

Astin found a hierarchy of institutions in terms of the ability of freshman class members. Using a variety of

14Ibid., p. 143.
measures but relying primarily on high school rank and standardized test scores as the most reliable measures of incoming classes, Astin developed a seven step selectivity index for 2300 colleges. The regional campuses of The Ohio State University were unranked in the seven step selectivity index, due in part to the lack of data and information about branch campuses as institutions. Astin did, however, make estimates of selectivity and attrition for all unranked institutions which led him to the finding that these institutions operated in a similar fashion to community colleges.\textsuperscript{15}

In addition to developing a hierarchy Astin found that the ability of the incoming class has a substantial effect on students within a class. The quality of the students in the class established a level of competition within the class.\textsuperscript{16} A given student's academic success and survival were affected more by the average ability of fellow students than by any other characteristic of the college.\textsuperscript{17} This effect was so strong as to lead Astin to state that a given


\textsuperscript{16}Ibid., p. 23.

\textsuperscript{17}Ibid., p. 292.
student is less likely to drop out (regardless of ability) at a more selective institution.\textsuperscript{18}

Astin reported that persistence rates were much higher for four year institutions when compared to two year colleges.\textsuperscript{19} He attributed this finding to lower academic ability and motivation in two year college students.\textsuperscript{20}

Using multiple regression equations based on student ability measures, Astin established a predictive model of the dropout probability for each institution in a national study. Four year institutions tended to have predicted attrition rates higher than the actual dropout count. Two year colleges tended to have higher attrition rates than those predicted. These results were obtained through Astin's analysis of data reflecting characteristics of the aforementioned 2300 two year and four institutions.\textsuperscript{21}

Wegner and Sewell examined the relation of type of college attended to graduation. Their study described a one-third probability sample of all 1957 male high school students.

\begin{itemize}
\item \textsuperscript{18}Ibid., pp. 27-29.
\item \textsuperscript{19}Ibid., p. 55.
\item \textsuperscript{20}Ibid., p. 50.
\item \textsuperscript{21}Ibid., p. 55.
\end{itemize}
seniors in the state of Wisconsin. The students in the study attended 126 four year colleges. These colleges were divided into eight nominal groups. Results indicate general support for the student characteristics—high rank in high school class, high intelligence, high occupational aspiration, and high socioeconomic status background—are associated with a greater probability of graduating from college, and that the differences in graduation rates between institutions generally correspond to differences in the type of students recruited. Second, through the use of regression analysis, college attended was found to have an independent effect on chances for degree completion beyond that explained by student ability measures.

Trent and Medsker (1965) found, in a group of 9778 students graduated from high school in 1959, that based on quality of student body as measured by high school rank, the hierarchy of institutions did exist. Institutions appeared to be stratified and were ranked progressively from low-scoring two year institutions through major research

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23Ibid., p. 668.

24Ibid., pp. 671-674, 678.

25Ibid., 674-675, 678.
universities on student ability measures. It is interesting to note that the student ability profile ranking matched the author's conception of comprehensiveness in mission.

High School Graduates' Class Rank Quintiles by Type of College Attended

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<td>Public university</td>
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<td>Private 4 or 5 year</td>
<td>69</td>
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<tr>
<td>Extension center</td>
<td>58</td>
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<td>Public 4 or 5 year</td>
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<tr>
<td>Public 2 year</td>
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Van Alstyne established in a large scale sampling of 1966 high school graduates that public sector university and four year college students have a lower attrition rate than two year colleges report. As noted, Astin supported this notion and expanded on it by attributing the higher attrition rate to lower ability and motivation levels in two year college students.

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27 Ibid., adapted from table 3.1.

DROPOUT FROM HIGHER EDUCATION

Tinto notes dropout includes a variety of behaviors and is imprecise in nature.\textsuperscript{29} (For purposes of this study the term attrition is used interchangeably with the term dropout. Both terms will be used to describe an interruption of students' academic careers before graduation.)

Tinto criticizes the research on attrition in higher education as over-compartmentalized and lacking conceptual framework. Research in the field has relied on correlation and regression analyses which emphasize specific characteristics of individuals who become attritions.\textsuperscript{30}

In place of the existing research Tinto suggests a theoretical model of dropout, based in Durkheim's model of egoistic suicide. Durkheim discussed a type of suicide which results from insufficient integration into the value structures and collective affiliation structures of society. Assuming the college environment to be a social system, Tinto develops a model of dropout which is an analogue of Durkheim's theory.\textsuperscript{31}


\textsuperscript{30}Ibid., p. 98.

\textsuperscript{31}Ibid., p. 91.
On the assumption that there are varying levels of individual characteristics, prior experiences, and commitments, Tinto argues that the individual's integration into the academic and social systems of the college relates to his continuation in college. The person's normative and structural integration into the academic and social systems lead to varying levels of commitment. The interplay between a person's commitment to the goal of college completion and his commitment to the institution determines whether the individual decides to drop out of college and the forms of dropout behavior the individual adopts.

Persistence was viewed as a result of input variables (individual characteristics, prior experiences and prior commitments) and the process of interactions with the college environment. Assuming unchanging external conditions, dropout was described as the result of the individual's experiences in the academic and social systems of the college. These experiences lead to varying levels of normative and structural integration in those collegiate sub-systems and to the re-evaluation and modification of commitments to the goal of college completion and to the institution.

Astin supports the notion of involvement (or integration) as important in affecting the decisions of
Based in a comprehensive analysis of the factors which prevent students from dropping out, Astin makes several statements which support Tinto's theory and the theory of involvement, as Astin chooses to name the phenomenon. Involvement theory holds that the student's tendency to drop out is inversely related to the degree of direct involvement in the academic and social life of the institution. In general Astin found that involvement in campus life and activities leads to greater persistence. Involvement in academic life takes precedence over other factors, especially when this is evidenced by a high grade point average. Other factors which influenced persistence were: a student's job, location of work assignment, residence patterns, and involvement in athletics or social life of the college.

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33 Ibid.
34 Ibid.
35 Ibid., pp. 98, 100.
36 Ibid., p. 63.
37 Ibid., pp. 63, 79.
38 Ibid., pp. 94-95
39 Ibid., pp. 107-108
Related research by Cope et al. and Astin and Panos supports the theories of involvement. Cope and his associates found that dropouts were characterized by a high degree of incongruence between college environments and their expectations, social and academic "presses", and environmental influences.\textsuperscript{40} In addition, a high degree of personal involvement on the part of professors and students and a high degree of familiarity with instructors diminished the dropout rate.\textsuperscript{41}

**COMMUTER VS. RESIDENT STUDENTS**

In summarizing a large number of studies which he reviewed for his book, *Commuting vs. Resident Students*, Chickering made the following statement:

Perhaps the most striking thing about these diverse studies is the results. Whatever the institution, whatever the group, whatever the data, whatever the methods of analyses, the findings are the same. Students who live at home with their parents fall short of the kinds of learning and personal development typically desired by the institutions they attend and which might reasonably be expected when their special backgrounds are taken into account. Students who live in college dormitories exceed the learning and personal development that are predicted when their advantages in ability, in prior educational and extra-curricular activities, and in community and family backgrounds are taken into account. During the freshman year and


\textsuperscript{41}Ibid., pp. 66-67.
during all four years for several different large samples, examined through simple retest comparisons and through complex multivariate analyses, the findings remain consistent.^2

Relating the summary to attrition Chickering further states:

Students who live at home, in comparison with those who live in college dormitories, are less fully involved in academic activities, in extra-curricular activities, and in social activities with other students. Their degree aspirations diminish and they become less committed to a variety of long range goals. They enter educationally and developmentally useful experiences and activities less frequently. They report a shrinking range of competence. Their self-ratings for a diverse array of abilities and desirable personal characteristics drop. Their satisfaction with college decreases, and they become less likely to return.^3

Although Chickering's analysis would seem to indicate an apples-oranges comparison when we compare Columbus and regional campus students, the comparison was included because the Columbus campus student body is used as a benchmark for comparison. The test employed is of the full articulation policy of the University.

After noting the discrepancy between resident and commuter students Chickering makes several recommendations concerning the dilemma he discussed. The purpose of the recommendations is to "help close the gap between those who


^3^Ibid., pp. 84-85.
can afford long residence on a college campus and those who cannot. The dilemma Chickering sees is summarized in the following sentence: "Both these groups of students pay the same tuition yet the educational benefits have been far from equal."  

The specific recommendations Chickering makes have the effect of increasing commuter student involvement in the academic life of the institution. He recommends the development of ways and means by which a student would increase his interaction with college and community resources, particularly those which have impact on academic and vocational development. The emphasis on encouraging involvement extends to the development of short term residential experiences.

The literature discussed here has been oriented toward the description of student-college environment interactions at a specific point in time with the specific characteristics. Tinto comes closest in his systemic interpretation of student-college interactions to a global model of those interactions. However, no studies were found that indicate the effect of planned change in the physical, academic, and

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44Ibid., p. 135.
46Ibid., pp. 134-135.
social life of an institution. The proposed study involves such a situation in the comparison of the regional campuses of the University over the period 1966 to 1971. We are examining a situation in which educational alternatives were introduced in the form of technical colleges and institutes.

DECLINE OF COLLEGE ADMISSION TEST SCORES

The American College Testing program has identified several uses for the assessment instrument. Two of these uses are of importance here, planning and institutional research. In using these scores in the analysis we must take into account the recent literature concerning the decline in ACT scores.

Decline in ACT scores, on a national basis and regional basis, has been assessed by several authorities. Munday noted an average composite standard score decline of 20.0 in 1966 to 18.9 in 1971. Average scores for the North Central region seemed slightly higher with a 20.02 average composite score reported for the year 1970-1971.

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49 Ibid., p. 6.
On a national basis Silver noted a decline in mean composite score of one standard score over the past ten years but that the ability to project college grades has remained stable over the years.  

Ferguson, in analyzing decline in ACT scores over the period 1964-1965 to 1974-1975 found a decline of 1.6 standard scores, or one half a standard deviation (19.9 to 13.3). This drop in mean scores indicated an average decline of .03 standard deviations per year for each of the last ten years.

Declines were found by researchers to be more heavily evident in verbal scores as opposed to the other subtests. Women students' scores declined at a faster rate than those of men.

Several sources of explanation for the decline in test scores have been isolated. Harnischifeger and Wiley note that curriculum studies showed a decline in enrollment in


53Ferguson, p. 4 and Harneschifeger and Wiley, p. 5.
academic courses in high schools and that these drops in enrollment closely parallel the achievement test score declines. The largest decline was found in traditional English courses, followed by mathematics and natural sciences. Munday noted that the source of the problem for colleges and universities may be in the enrollment of students with lower scores and that more students with lower ability levels were taking the ACT in relation to a static number of high ability students. Ferguson concurred in the analysis of the relationship between low and high scoring students in his finding that a large increase in the number of students scoring between 1 and 15 on the composite score has not been balanced by a similar increase in the number of those scoring in the 26-36 range.

With respect to the comparative use of ACT scores in research, Harnischifeger and Wiley noted that the composition of the ACT assessment has not changed over the years. Silver noted that the ability of the test to project college

54Harnischifeger and Wiley, p. 10.
55Ibid.
56Munday, Declining Admissions, p. 29.
57Ferguson, p. 24.
grades has remained stable. Maxey and Ferguson noted that the use of junior year scores in predicting college grades was at least as successful as the use of senior year scores.

ARTICULATION AND TRANSFER OF STUDENTS

State policy and practice concerning articulation between two year and four year institutions has been the subject of several studies. Frederick Kintzer found that 39 states had articulation or transfer policies concerning the successful completers of two year programs. However, in an earlier study he found that among the states with no articulation policies were Ohio, Pennsylvania, and South Carolina, states with highly developed branch campus systems.

In a study which discussed major universities and the attrition of two year college transfers, Knoell and Medsker found that of the institutions studied The Pennsylvania State University had the lowest attrition rate of transfer

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students. This was attributed to the smooth articulation between branch campuses and the central campus. 61 Penn State, with its Commonwealth Campuses, was the only institution studied which had a system of branch campuses as feeder institutions.

POLITICAL ISSUES AND TWO YEAR INSTITUTIONS

A background problem exists in what may broadly be called the political arena. This is not meant in the narrow sense of partisan politics and the state legislature but in the broad sense of interactions between the state coordinating board, the state legislature, and the major and minor state higher education institutions. Vice-Chancellor of the Ohio Board of Regents for two year campuses, Max Lerner has referred to the power of The Ohio State University as a major force to be contended with in the support and development of higher education as compared to the relative lack of power on the part of the state assisted two year community, general and technical colleges. 62


62 Max Lerner, "Institutional Research for Two Year Campuses" Remarks delivered at a seminar sponsored by College Entrance Examination Board and The Ohio Board of Regents, (Columbus, Ohio: March 11, 1977).
Little has been written about this issue; however, there are two major sets of recommendations, one made to the legislature and one made by the Board of Regents with respect to the consolidation of two year campuses in Ohio which should be discussed in this light.

Warren King and Associates, a management consulting firm, in a report to the Joint Legislative Commission to Review the Administration of Education in Ohio, recommended the consolidation of the system of branch campuses as an efficiency move.\(^{63}\) Independently, unidentified consultants to the Board of Regents recommended that the 1971 Master Plan include a section concerning the management efficiency of consolidation of the branch campus system in the state. As noted in other contexts in the study, the Regents did recommend the consolidation of campuses which existed into a state system of general and technical colleges.

Both of these recommendations were discarded within the political process of the state legislature. This indicates the political nature of the existence of branch campuses in Ohio. In light of two expert analyses of the management efficiency and the stated recommendation of the state

\(^{63}\)Warren King and Associates, "Management Study and Analysis. Ohio Public Higher Education" Report to the Joint Legislative Commission to Review the Administration of Education in Ohio, (December 1969) ED041531
coordinating board, these recommendations were not favorably received by the state legislature.

John Millet, first chancellor of the Ohio Board of Regents, while not focusing on the particular instance in question, states that branch campuses did at times figure in the political negotiations concerning the funding and organization of higher education in Ohio.64

Other accounts of the politics of decision-making with respect to branch campuses substantiate the political nature of the organization and location of branch campuses65 and two year college articulation policies.66 Altman, in a study of upper division colleges, notes that the politics of higher education in Pennsylvania included strong feelings and political pressure related to the development of branch campuses and community colleges.67

**Historical Issues at The Ohio State University 1966-1971**

The period covered by the study is one of political turmoil nationally and on the Columbus campus of The Ohio State University. The first demonstration concerning

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64 John Millett, p. 18.


national politics during this period as recorded by the University historian, Francis Weisenburger, was in December 1967. Relatively small demonstrations involving 50 to 100 individuals continued to occur through the late Sixties. 68

Widespread activism and intensity of student demonstrations peaked in the Winter and Spring quarters of 1970. During this time students protested concerning racial issues, student participation in governance and violently against the war in Vietnam. Several violent demonstrations occurred and the University was closed to students and staff from May 6 to 19. 69

The writer is aware of no studies which investigated the effect of these events on attrition or other factors included in this study.

An additional political factor which may have affected differences between these two groups of students was the selective service system and the military draft. Male students entering in 1966 were subject to conscription throughout their academic careers. By April of 1970 a lottery system was instituted which reduced pressure to stay in school for some male students. However, through the

69 Ibid., pp. 169-172.
academic careers of most male students entering the University in 1966 at all campuses, an added incentive existed to remain in school and to make normal progress toward the students' academic objective. For students entering in 1971 the pressure decreased with the expiration of the selective service law in June of 1973.

The effect of the factors outlined above is difficult to determine. Data concerning these issues and their effect on the problems addressed here is unknown to the writer. Surely some students remained enrolled at The Ohio State University because of the military draft. However, it is more difficult to project the effect of student activism on a comparison of academic characteristics of Columbus and regional campus students.

University policies concerning factors which might affect a student's ability to complete a degree changed during the period of the study. For those students entering in 1966 a firm rule requiring a grade point average of .75 in the first quarter in order to continue in the University was in force. Students at that time were eligible for dismissal immediately upon completion of a quarter in which the student met the dismissal standard with no provision for probation.\footnote{The Ohio State University Bulletin 1966-67, Vol. LXXI, July 1, 1966, pp. 53-58.}
By 1971 a deficiency point system was introduced which in effect raised the standard for dismissal for full-time students by requiring students to carry less than 15 quality points in deficiency based on a 2.0 grade point average (GPA). For a student carrying 15 quarter hours the GPA dismissal standard was 1.00 at the end of the first quarter rather than the .75 under 1966 rules. However, a liberalization of the rules was added in the form of a standard probation quarter which allowed a student, in effect, a second chance. In succeeding quarters a probationary student was required to earn a 2.00 average or above in order to avoid dismissal.

In addition, by 1971 the University had added a pass/non-pass option, which included a non-punitive non-pass grade. Other procedural changes included the liberalization of drop and withdrawal procedures and the possibility of an undergraduate taking an individual investigation course on a satisfactory/unsatisfactory grade policy. 71

CHAPTER III

PRESENTATION OF FINDINGS

In chapter one the study was introduced, historical background of the problem was discussed in detail, and the procedural and statistical methodology was outlined. In chapter two an in-depth review of the literature with respect to all aspects of the problem was reported. The execution of procedures, statistical analysis, and results of the study will be reported in Chapter 3.

SAMPLE SELECTION AND DATA COLLECTION

Sample Selection

In order to select the sample population used in the study, lists of members of the population of all students entering the University as new first quarter freshmen were obtained through the Office of the Assistant Vice-President for Registration Services at The Ohio State University. The data needed for the study were located in the Office of Testing and Evaluation and the Office of Records.

The initial data and sample selection procedures were accomplished in cooperation with the Office of Testing and Evaluation. This office maintains testing and other data on
all new first quarter freshmen entering the University. As part of its archive of information concerning entering classes, bound volumes containing test results of all students entering the University are maintained for each academic year.

The Columbus campus samples were chosen from these bound volumes through the use of a table of random numbers and procedures found in Games and Klare, Elementary Statistics.\(^1\) Random selection without replacement was used in selecting subjects.

Each member of the population was identified by a number corresponding to the number of the page on which his/her name was listed and the line number on which his/her name appeared. Numbers for pages and line numbers were chosen by selecting a random starting place in the table and reading series of five digit numbers, the first three of which indicated a page number and the final two a line number. In this way 200 random combinations of page number and line number were chosen.

Subjects were then chosen according to the limitation established earlier, that each subject be a new first quarter freshman (in this case) entering the Columbus campus.

Two hundred subjects were chosen in this manner. For each sample an additional sample was chosen and maintained in order of random choice to cope with those subjects chosen as a part of the original 200 who were later found to not meet the requirements of the study.

The regional campus sample was chosen through the stratification technique outlined in chapter one, students from each campus for each year of entry to be considered. Each campus (Lima, Mansfield, Marion, and Newark) contributed 50 members to each of the two regional campus samples of 200 (1966, 1971).

The mechanics of selection for regional campuses differed from the mechanics of selection for the Columbus campus sample. Each quarter summary lists of students entering the campuses of The Ohio State University, which include ACT scores for each campus, are distributed. While only yearly lists were available in the Columbus campus Office of Testing and Evaluation, quarterly testing lists were maintained by three of the four regional campuses (Lima, Marion, and Newark). For these campuses lists of Fall quarter 1966 and Fall quarter 1971 entering students were available. In these cases each new freshman was assigned a number beginning at one and progressing to the total number in the population. Fifty subjects were chosen using a table of random numbers. Again, an additional
sample was maintained for those cases eliminated as not meeting the criteria for inclusion in the study.

For the Mansfield Campus sample the group of entering freshmen for 1966 and 1971 were isolated and counted in the yearly summary volumes available in the Office of Testing. The random sample of Mansfield students was then chosen from the summary list in the way students were chosen for the other regional campuses.

Data Collection--ACT Score

For each student included in the sample, data was copied on index cards indicating name, student number, campus, year of entry, and ACT composite score.

Data Collection--Attrition, Non-Attrition, Senior Level GPA

The second phase of data collection involved the search for the university transcript information for each subject in the Office of Records-Transcript Department. In the transcript vault and the work area a transcript of the academic record of every individual who has attended the University and generated a record is maintained in alphabetical files. The transcript of each student whose record was not activated during the study was pulled and evaluated. For students whose records in the University are active, i.e. the student is currently enrolled, recently enrolled or planning to return, separate files are maintained. Given
the number of such file categories actual transcripts were difficult to locate.

For students with active records the University maintains a Student Data Base computer program which includes every active student record. Access to the Student Data Base file is by Cathode Ray Tube (CRT) terminal. Each active student record is identified by name and student number.

Each student for whom a transcript was not found in the inactive transcript file was entered by name into a Student Data Base CRT terminal in order to determine whether the subject was currently enrolled. The information available for each student included: name, student number, address (local, home and an emergency reference), college of enrollment, major current registration information, grades by course, and cumulative and quarterly averages.

If a student was determined to be currently enrolled for the purposes of the study, no further record check was necessary. For all students not currently enrolled in the University transcripts were then located in the transcript vault.

While the description here is lengthy it is a summarization. Actually three separate searches through both the transcript file and SDB computer file were completed. All subjects at that time were accounted for in one of the
following ways:

1. A complete file of data was obtained for the study.
2. The subject was eliminated because inaccurate information as to: status as a new first quarter freshman, or entry into the University led to his/her listing on the Testing List when he/she should not have been listed.

The information required in this phase of data collection was attrition information and senior level grade point average for those students who had graduated. Each transcript or SDB file was evaluated to determine first whether a student was currently enrolled and pursuing an initial undergraduate degree, graduated from a baccalaureate program of the University, or not currently enrolled and not graduated.

At this point two adjustments in data collection procedures were necessary. Three subjects in the study, two in the Columbus 1966 entering sample and one in the Columbus 1971 sample, were discovered who had not graduated from a baccalaureate program of the University but received professional degrees after having enrolled in professional school following three full-time years of undergraduate study. These individuals were pooled to form a separate category in data collection. In reporting results this category was pooled with currently enrolled students and
graduates to fill the category of non-attrition in the analysis.

Secondly, during the collection of attrition information a question occurred to the researcher with respect to the equal treatment of the groups of subjects by year. The project was proposed with the assumption that data would be collected at a point in time with students entering in 1966 and 1971 treated equally.

The data were collected during Winter quarter 1978, eleven and one half years after the entry of the 1966 group but only six and one half years after the entry of the 1971 group. Because this situation might have led to a lack of equal treatment of data by years, a point was chosen six and half years after the entry of the 1966 group. Therefore, all data concerning attrition were calculated as of Winter quarter 1973 for those subjects who entered in 1966. In this way the study was controlled in order to equate the time periods compared during which a given subject might have attended the University.

For those subjects who had graduated from a baccalaureate program of the University, a senior level grade point average was computed for each student record. For purposes of the study senior level is defined by the University class ranking system as all quarter hours earned after a student has earned his one hundred thirty-fifth hour.
Senior level grade point average was computed by the researcher using the following method: A student who had earned a baccalaureate degree was considered to have reached the senior level in the quarter in which he earned his 135th hour. The student's overall grade point average, quality points earned, and quarter hours attempted were recorded. In addition, his grade point average, quality points earned, and quarter hours attempted were recorded at the time of his graduation. In order to compute senior grade point average the following arithmetic problem was computed for each subject: Quality points earned in senior year ÷ hours attempted as of graduation - hours attempted as of the beginning of the senior year.

All calculations were computed on a Monroe 1405 four function calculator with tape printout and checked against grade point average at graduation and at the end of junior year in order to detect errors which would result in spurious data. All averages were recomputed in order to check for errors.

At the completion of data collection each sample included in the study consisted of 200 person verified as having legitimate membership in the sampled population. In addition, ACT composite score, attrition information, and senior level grade point average for all students who had
graduated from baccalaureate programs at the University were available for each subject.

Data Coding

In chapter one a requirement of confidentiality of data was discussed in relation to the Family Educational Rights and Privacy Act. In order to comply with this Act in insuring that no identifiable student or former student's record could be taken from the data of this study, dummy subject numbers were assigned to each subject. The data were coded on IBM FORTRAN coding forms and verified. Each subject's record included his/her campus and year of entry, two digit ACT composite score, a three digit identification number between 001 and 200, and four pieces of data which together determined his/her attrition status and grade point average if the student had graduated.

Each subject was coded as being either an attrition, a graduated student with a three digit grade point average (missing data were reported for others), a person with a professional degree but no baccalaureate, or currently enrolled. All of these categories are mutually exclusive so that for verification of data entry a student could have an affirmative score to only one possibility.

The data were then keypunched for card input to the Statistical Package for the Social Sciences for 05/360
Version H program. The keypunch operator and the researcher both verified the date before their entry into the computer.

After all data were coded and entered by keypunch on card input medium, the statistical analyses outlined in Chapter one were performed.

PROBLEM ONE

A. Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State University regional campuses during Fall quarter 1966 and those entering Fall quarter 1971?

B. Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State University at the Columbus campus during Fall quarter 1966 and those entering in Fall quarter 1971?

C. Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State University during Fall quarter 1971 at the Columbus campus and those entering regional campuses in 1971?

As noted above, and also in Chapter one, a comparison of ACT composite scores between campus and year of entry groups involves two independent variables which exist as natural, non-metric variables in the study. These variables
by definition are considered factors in an analysis of
variance interpretation. A two factor factorial design in
analysis of variance was chosen for this problem.

In the non-experimental use of this statistical pro­
cedure the categories of the factors (campus and year of
entry) are considered fixed. This is due to the fact that
these categories would not change over repeated experiments.
These conditions meet the specifications of SPSS ANOVA in
that the assumption made is that all categories are fixed
and represent all those categories to which inferences are
made. In addition, SPSS assumes random sampling to develop
experimental groups rather than random assignment of
individuals to treatment groups.

The analysis of effects is considered to be orthogonal
in that each cross-classification in the design has equal
cell frequencies. A classical approach to the analysis of
variance problem with a fixed effect or linear hypothesis
statistical model was used.

Factorial analysis of variance analyzes the independent
and interactive effects of two or more independent variables

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2Nie, et. al., Statistical Package, p. 399.
3Ibid.
4Ibid., pp. 399-400.
on a dependent or criterion variable. In this case factorial analysis of variance allowed for the isolation of the effects of campus and year as factors.

If each cell of a cross-classification among factors has exactly the same number of cases all factor effects are orthogonal; not only is the effect of each factor independent of the defects of other factors but the interaction effects among various factors are orthogonal to main effects.

The data were read into SPSS subprogram ANOVA which solves up to 5-way analysis of variance problems. A two factor factorial analysis of variance was performed on the data with the results shown in Table 4. The main effect of campus on ACT score is significant at a level beyond .001, F=19.661 with 1 degree of freedom. This significant main effect shows the difference exists between Columbus campus and regional campus students on ACT scores when the two years of entry are pooled for each group.

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6 Ibid., p. 400.
<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of square</th>
<th>DF</th>
<th>Mean square</th>
<th>F</th>
<th>Significance of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campus</td>
<td>430.711</td>
<td>1</td>
<td>430.711</td>
<td>19.661</td>
<td>0.000</td>
</tr>
<tr>
<td>Year</td>
<td>0.451</td>
<td>1</td>
<td>0.451</td>
<td>0.021</td>
<td>0.886</td>
</tr>
<tr>
<td>Two way interaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Campus-year)</td>
<td>85.151</td>
<td>1</td>
<td>85.151</td>
<td>3.887</td>
<td>0.049</td>
</tr>
<tr>
<td>Residual (within groups)</td>
<td>17437.578</td>
<td>796</td>
<td>21.906</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17953.895</td>
<td>799</td>
<td>22.470</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The variation between the years 1966 and 1971 is shown in the main effects of the year variable. This effect was found to be non-significant with a very low F ratio of 0.021. This indicates similarity in the overall distribution of the scores by year when campuses are pooled.

The interaction measure, variation due to the two variables in combination with each other and independent of the main effects of campus and year, is significant beyond the .05 level. This indicates some variation of scores across categories which will result in graphic representation of the change in scores between years for each campus in a non-parallel configuration.

The focus of the analysis, as noted earlier, is not on the relationship expressed in the analysis of variance table. The significance of the results leads us to the conclusion that differences exist between cells in the design on ACT score measures.

A post hoc pair-wise comparison of cell means in the design was specified in the three questions in problem one. The specific pairs to be discussed are: Columbus 1966 with Columbus 1971, regional campuses 1966 with regional campuses 1971, and Columbus 1971 and regional campuses 1971. In order to complete this analysis the data were broken down by campus and year designations through the use of SPSS sub-program Breakdown. Sub-program Breakdown enables the
researcher to obtain means, standard deviations, and variances of a dependent variable for classifications of from one to five independent variables. In this instance the independent variable ACT composite score was broken down first by campus and then by year classifications.

Table 5 lists the results of the procedure.

<table>
<thead>
<tr>
<th>Campus</th>
<th>Year of Entry</th>
<th>Row Mean</th>
<th>1966</th>
<th>1971</th>
<th>20.540</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus</td>
<td></td>
<td></td>
<td>22.310</td>
<td>21.705</td>
<td>22.0075</td>
</tr>
<tr>
<td>Regional campuses</td>
<td></td>
<td></td>
<td>20.190</td>
<td>20.890</td>
<td>20.540</td>
</tr>
<tr>
<td>Column Mean</td>
<td></td>
<td></td>
<td>21.250</td>
<td>21.298</td>
<td></td>
</tr>
</tbody>
</table>

Mean difference between 1966 and 1971 entering freshmen at all campuses pooled = .0475

Mean difference between students entering regional and Columbus campuses with years pooled = 1.468

\(^7\)Ibid., p. 249.
The mean differences listed at the bottom of Table 5 are indicative of the relationship expressed in the main effects measure in the ANOVA table. The mean difference between 1966 scores on the ACT composite score and 1971 scores is .0475 points. This reflects both the low F ratio and the non-significant main effect for the factor year.

A graphic illustration of the interaction effect is outlined in Figure 1. The four cell means are plotted on the graph to demonstrate the type of interaction found in the ANOVA problem.

Figure 1

GRAPHIC ILLUSTRATION OF CHANGE IN ACT MEAN SCORES BY CAMPUS ENTRY GROUP

<table>
<thead>
<tr>
<th>ACT composite</th>
<th>20</th>
<th>Regional campuses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

The data included in the graph illustrates the slight decline in ACT scores for Columbus campus NFQF and a slight increase in the overall mean scores for regional campus NFQF. The non-parallel configuration was indicated in the significant interaction measure.
Using the data resulting from the Breakdown procedure, a Fisher LSD (Least Significant Difference) or "protected" t test procedure was applied using the specified cell means. This procedure is applied only if an overall F test has resulted in the rejection of the null hypothesis that all K means are equal. The data presented in the solution of the ANOVA problem meet this assumption.

By requiring the ANOVA F to be significant the experimentwise error or error due to the use of multiple tests with a specified significance level is controlled. In multiple unprotected t tests the experimentwise error, when pooled, results in a larger probability of Type I error than indicated in any specific test.

Fisher's LSD controls a large experimentwise error while providing relatively high power in detecting population differences, thus controlling for Type II errors.

When all groups have equal N's, as in the case of this analysis, the least significant difference is found by the formula

\[ \text{LSD} = t \cdot \frac{MS_w \left( \frac{2}{N} \right)}{t - \text{studentized t}} \]

LSD - Least Significant Difference
\( t \) - studentized t
\( MS_w \) - mean square within
\( N \) - number of subjects

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Based on this formula the least significant difference level for LSD (.05) = .919 and for LSD (.10) = .776.

Individual pairwise comparisons were made for each of the three questions state in problem one. For each combination of means the smaller was subtracted from the larger and compared to the LSD criterion at both the .05 and .10 levels.

Fisher's LSD Problem 1A

Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State University regional campuses during Fall quarter 1966 and those entering Fall quarter 1971?

\[
\bar{X}_{RC71} - \bar{X}_{RC66} = 20.89 - 20.19 = .70 < .776
\]

The mean difference between students entering the regional campuses in 1971 and 1966 is .70 ACT composite score points. This difference is lower than the least significant difference identified at significance levels .10 and .05.

Fisher's LSD Problem 1B

Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State University at the
Columbus campus during Fall quarter 1966 and those entering in Fall quarter 1971?

\[ \bar{X}_{C66} - \bar{X}_{C71} \]

\[ 22.31 - 21.71 = 0.60 < 0.776 \]

The mean difference between students entering the Columbus campus in 1966 and 1971 is 0.60 ACT composite score points. This difference is less than the least significant difference identified at significance levels .10 and .05.

Fisher's LSD Problem 1C

Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State University during Fall quarter 1971 at the Columbus campus and those entering regional campuses in 1971?

\[ \bar{X}_{C71} - \bar{X}_{RC71} \]

\[ 21.7 - 20.89 = 0.82 > 0.776 \]

significant beyond .10

The mean difference for ACT composite score of students entering the Columbus campus in 1971 and students entering the regional campuses in 1971 was .82. This mean difference meets the criterion for least significant difference at the .10 level of significance.
Summary

In the overall analysis of variance problem the main effects measure of the variable campus showed a significant F beyond the .001 level, thus indicating the significant difference between Columbus and regional campus students when the two years included in the study were pooled. Secondly, the analysis of variance showed a significant interaction due to the effect of year and campus in addition to their effects individually. The graphic illustration of this indicated a slight rise in scores at regional campuses and a slight decline in scores at Columbus when 1971 was compared to 1966.

In post hoc analysis mean scores derived from SPSS subprogram Breakdown were compared by the Fisher LSD procedure. Of those differences observed between the cells in the design on ACT composite score mean, only the difference between students entering Columbus and regional campuses in 1971 was significant. Based on these results it is likely that there is a difference in the population between the mean ACT composite scores of Columbus 1971 and of 1971 regional campus entering freshmen. Comparisons between 1966 and 1971 entering freshman classes were not significant for either Columbus or regional campuses.
PROBLEM TWO

What is the relationship between the attrition rates of the campus entry groups included in the study (Columbus 1966, Columbus 1971, regional campus 1966, and regional campus 1971)?

For this analysis subjects were pooled into two groups. The attrition group included all students who were either dropouts or academic dismissals at the determined date for data collection. As explained earlier in this chapter, these dates were chosen as of Winter quarter 1978 for those entering in 1971 and Winter quarter 1973 for those entering in 1966.

The group labeled non-attritions included all those who, for purposes of the study, were currently enrolled in a degree-granting college of The Ohio State University, those who had graduated from the University with baccalaureate degrees, and those who received graduate professional degrees from the University but had not completed a baccalaureate degree.

Problem II outlined a comparison of the campus and year of entry groups based on attrition. The solution to this problem paralleled the methodology of problem one in forming paired campus and year of entry groups in a chi-square analysis.
Pearson's chi-square test of independence, chosen for analysis of this problem, is specifically suited to the analysis of true nominal level (or categorical) data which represent the independent events. The analyses completed in this problem are designed to determine if the null statistical hypothesis, that relationships shown in the chi-square contingency table are not significantly different from random probability, is true. Rejection of the null hypothesis indicates that the variables are correlated. The first two analyses compared attrition rates between campuses for each year of entry examined in the study. (See Table 6 and 7)

**TABLE 6**

CHI-SQUARE CONTINGENCY TABLES FOR ATTRITION - NON-ATTRITION BY CAMPUS FOR 1966

<table>
<thead>
<tr>
<th></th>
<th>Attrition</th>
<th>Non-Attrition</th>
<th>Row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus</td>
<td>100</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Regional Campuses</td>
<td>151</td>
<td>49</td>
<td>200</td>
</tr>
<tr>
<td>Column Total</td>
<td>251</td>
<td>149</td>
<td>400</td>
</tr>
</tbody>
</table>

\[ X^2 = 46.24 \quad \text{significance} = .001 \quad \text{or beyond with 1 degree of freedom} \]

For students entering in 1966 a significant relationship exists between the campus of entry and the pattern of attrition. The \( X^2 \) of 46.24 is significant beyond the .001 level for one degree of freedom.
In the case of 1971 (Table 7) a chi-square value of 8.71 with one degree of freedom is significant beyond the .005 level.

TABLE 7

CHI-SQUARE CONTINGENCY TABLES FOR ATTRITION - NON-ATTRITION BY CAMPUS FOR 1971

<table>
<thead>
<tr>
<th>1971</th>
<th>Attrition</th>
<th>Non-Attrition</th>
<th>Row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus</td>
<td>104</td>
<td>96</td>
<td>200</td>
</tr>
<tr>
<td>Regional Campuses</td>
<td>133</td>
<td>67</td>
<td>200</td>
</tr>
<tr>
<td>Column Total</td>
<td>237</td>
<td>163</td>
<td>400</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 8.71 \quad \text{significance} = .005 \text{ beyond with 1 degree of freedom} \]

For both years of entry in the study a significant relationship was found between campus of entry and attrition rate.

In order to detect changes in the attrition rate of the campuses of the University a second series of two paired comparisons was tested, controlling for campus of entry while comparing years of entry.

A chi-square test was applied to the data on attrition for students entering at the Columbus campus in the years 1966 and 1971, as shown in Table 8.
In comparing the attrition rate for the Columbus campus samples the null hypothesis as assumed in the chi-square calculation was accepted, indicating no relationship between year of entry and attrition data. Essentially, with column percentages of 50 and 52 for the attrition factor, the attrition rates stayed the same in the two samples five years apart.

The chi-square computed for regional campus students entering in 1966 and 1971 is outlined in Table 9.
TABLE 9
CHI-SQUARE OF INDEPENDENCE FOR REGIONAL CAMPUSES
BY YEAR

<table>
<thead>
<tr>
<th>Regional campuses</th>
<th>Attrition</th>
<th>Non-Attrition</th>
<th>Row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>151</td>
<td>49</td>
<td>200</td>
</tr>
<tr>
<td>1971</td>
<td>133</td>
<td>67</td>
<td>200</td>
</tr>
<tr>
<td>Column Total</td>
<td>284</td>
<td>116</td>
<td>400</td>
</tr>
</tbody>
</table>

\[ X^2 = 3.93 \quad \text{significance} = .050 \]

With the result of chi-square equal to 3.93 at one degree of freedom a table value for significance was found beyond the .05 level.

Summary

Attrition-retention proportions for the four campus and year of entry groups (Columbus 1966 and 1971, regional campuses 1966 and 1971) were compared using chi-square. A significant relationship was found between campus of entry and attrition/non-attrition for both years in the study. In both cases the Columbus campus attrition proportion was smaller. When regional campus attrition-retention proportions were compare by year, a significant relationship was found between year of entry and attrition. The chi-square comparing Columbus 1966 and Columbus 1971 was not significant.
PROBLEM THREE

What is the relationship between the groups of students defined as attritions and those defined as retentions at The Ohio State University when compared on ACT composite ACT composite score measures for each campus-year of entry described in the study?

As outlined in Chapter one, problem three examines the relationship between the attrition of students matriculating in each campus-year environment and ACT composite scores. ACT scores are assumed to be normally distributed at each campus during each year and in the general population. Attrition, as discussed previously, is a nominal variable. Although the distinction between attrition and retention is being made on a nominal level we must note an underlying assumption that achievement levels will vary within the two categories. Students have varying levels of success within both categories in terms of grade point average, number of quarters completed (either before attrition or in time required to attain a degree).

In the case of a dichotomized, but normally distributed, variable examined for correlation with an interval level variable, a biserial r is considered to be adequate. Correlation was computed for ACT composite scores of attritions and retentions for each of the four cells in the
primary design of the study, students entering: regional campuses 1966 and 1971 and Columbus 1966 and 1971.  

The formula for biserial r is outlined below:

\[ r_b = \frac{\bar{X}_p - \bar{X}_t(P)}{St(y)} \]

\( r_b \) = biseral r  
\( \bar{X}_p \) = mean score on continuous variable of the successful group  
\( \bar{X}_t \) = mean score of the entire sample on the continuous variable  
\( St \) = standard deviation of the entire population  
\( P \) = the proportion scoring in the successful group  
\( y \) = the ordinate obtained from the normal probability table, cutting off an area equal to P

In order to obtain the data needed to compute biseral r for each sample population (Columbus 1966, Columbus 1971, regional campuses 1966, and regional campuses 1971), SPSS sub-program Breakdown was used to obtain ACT score means, standard deviations, and number of students for each of several categories. The ACT score data was printed in branching format as the program sorted the data by the following procedure: scores for the total population, scores by campus designation, by year designation, and

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\(^9\)Guilford, Fundamental, pp. 293, 297.
finally by attrition and non-attrition groups. Using the data output of sub-program Breakdown, Table 10 was used to compute biserial $r$, its standard error, and a $t$ value to be used as a significance test.

**TABLE 10**

ACT SCORE MEANS, STANDARD DEVIATIONS AND PROPORTIONS OF ATTRITION AND NON-ATTRITION BY ENTRY GROUP

<table>
<thead>
<tr>
<th></th>
<th>Mean score</th>
<th>Standard deviation</th>
<th>Mean score of non-attrition group</th>
<th>Proportion in non-attrition group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus 1966</td>
<td>$\bar{X}_t$</td>
<td>22.31</td>
<td>4.19</td>
<td>.50</td>
</tr>
<tr>
<td>Columbus 1971</td>
<td>$\bar{X}_t$</td>
<td>21.71</td>
<td>4.73</td>
<td>.48</td>
</tr>
<tr>
<td>Regional campuses 1966</td>
<td>$\bar{X}_p$</td>
<td>20.19</td>
<td>4.85</td>
<td>.245</td>
</tr>
<tr>
<td>Regional campuses 1971</td>
<td>$\bar{X}_p$</td>
<td>20.89</td>
<td>4.92</td>
<td>.335</td>
</tr>
</tbody>
</table>
The results of the biserial $r$ computations are listed in Table 11.

**TABLE 11**

**BISERIAL $r$ AND SIGNIFICANCE TESTS**

**BY ENTRY GROUP**

<table>
<thead>
<tr>
<th></th>
<th>$r_b$</th>
<th>$SE_{r_b}$</th>
<th>$t$</th>
<th>significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus 1966</td>
<td>.47</td>
<td>.088</td>
<td>5.31</td>
<td>.01</td>
</tr>
<tr>
<td>Columbus 1971</td>
<td>.21</td>
<td>.089</td>
<td>2.31</td>
<td>.05</td>
</tr>
<tr>
<td>Regional campuses 1966</td>
<td>.31</td>
<td>.096</td>
<td>3.22</td>
<td>.01</td>
</tr>
<tr>
<td>Regional campuses 1971</td>
<td>.37</td>
<td>.100</td>
<td>3.73</td>
<td>.01</td>
</tr>
</tbody>
</table>

The specified null hypothesis for a biserial $r$ is that there is no difference between the dichotomized groups on the continuous variable. In that case biserial $r$ will be equal to zero. In order to test the null hypothesis a standard error ($SE_{r_b}$) was computed for each correlation coefficient using the formula $SE_{r_b} = \frac{Pr(1)}{\sqrt{N}}$, as shown in Table 8. In each case $r_b$ is at least twice as long as $SE_{r_b}$, which indicates that it is somewhat unlikely that the data result from a population in which the correlation is zero.  

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As the difference between means increases, the correlation coefficient increases. By inspection of the data the campuses may be rank ordered in the following manner by the apparent strength of difference:

TABLE 12
RANK ORDER OF BISERIAL r BY ENTRY GROUP

<table>
<thead>
<tr>
<th>Campus</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus 1966</td>
<td>.47</td>
</tr>
<tr>
<td>Regional campuses 1971</td>
<td>.37</td>
</tr>
<tr>
<td>Regional campuses 1966</td>
<td>.31</td>
</tr>
<tr>
<td>Columbus 1971</td>
<td>.21</td>
</tr>
</tbody>
</table>

As a further measure of the strength of the data Downey and Heath suggest a t statistic computed by the formula

$$t = \frac{r_b}{SE_{r_b}}$$

The result of this t test is listed in Table 11. All $r_b$ calculations resulted in significance levels beyond .05 and Columbus 1966, Regional campuses 1966 and 1971 were significant beyond the .01 level.

Summary

ACT composite score data was used to compare attrition and retention groups in a biserial r analysis. All groups

---

in the study produced significant bi-serial r calculations, indicating significant differences between attrition and retention groups on ACT scores.

PROBLEM FOUR

What are the independent and combined effects of ACT composite score and campus and year of entry on the senior level grade point average of students in the study who graduated from the University?

The statistical methodology for question 4, the analysis of the predictive nature of campus and year of entry and ACT composite scores on senior level grade point average, required the use of multiple regression analysis. ACT scores, normally distributed interval level data, were used as one independent variable. Campus and year of entry were coded as three dummy variables. Dummy variables are created in order to include categorical information in a regression equation in the form of vectors. Three vectors will be used in order to conform to the rule of K-1 dummy variables as outlined by Nie et al.\(^{12}\) and Kerlinger and Pedhazur.\(^{13}\)

The use of multiple regression analysis in situations involving both continuous and categorical or nominal

---

\(^{12}\)Nie et al., *Statistical Package* pp. 374.

\(^{13}\)Kerlinger, *Multiple Regression* pp. 105-107.
variables involves a special case of the method. The re­
searcher seeks to determine whether knowledge of group mem­
bership will significantly reduce errors of prediction as 
compared to errors made when group membership is not 
specified.\textsuperscript{14}

In this case we attempted to explain the prediction of 
senior level grade point average using ACT composite scores, 
adding campus of entry groups in order to estimate the pre­
dictive effect of campus of entry on senior level GPA.

Regression equations occur in the form of "slope-y 
intercept" equations in matrix algebra (\(y = bx + a\)). The 
analysis involved the plotting of four regression vectors 
representing the four campus/year of entry groups. Vectors 
were compared in terms of slope to ascertain the effect of 
the continuous variable (ACT). Significance tests were 
calculated which determined whether any difference in \(b\) or 
slope co-efficients is due to chance.\textsuperscript{15} Difference in the 
effect of "\(a\)" co-efficients or intercepts was determined by 
the use of statistics which show difference between and 
among the four intercepts. The intercepts were defined by 
the particular characteristics of the dummy variable groups 
determined by the campus year classification.\textsuperscript{16}

\textsuperscript{14}Ibid., pp. 102-103.
\textsuperscript{15}Ibid., pp. 232-233.
\textsuperscript{16}Ibid., pp. 237-238.
Earlier, in the analysis of variance problem (Problem 1), we discussed the relationship between categorical variables (campus and year groups) and a continuous variable (ACT score). In this problem the data used in Problem 1 was used in a prediction problem involving senior level grade point average.

Kerlinger notes that in a situation which the researcher uses intact groups and when the researcher suspects difference on a predictor variable between the groups, the adjustment for potential difference on the continuous variable is done through the use of a regression approach to analysis of co-variance.\(^1\)

SPSS in sub-program Regression describes an analysis of co-variance as a special case of regression in which one or more metric variables are combined with an attribute variable.\(^2\) In this case campus and year of entry groups were treated as factors and ACT scores were treated as a co-variate. In the case in which there may be differences in the slope of the regression vector an interaction between the attribute variable and the co-variate is hypothesized and tested through the use of an interaction model for regression computations. This model includes terms

\(^1\)Ibid., p. 266.

\(^2\)Nie et al., Statistical Package p. 381.
which are created by computing products of paired scores of dummy variables with co-variate scores (in this case, ACT scores).  

The full or saturated regression model for a nominal level variable with four groups and one co-variate is algebraically stated in the following way:

\[ Y' = A + B_1 D_1 + B_2 D_2 + B_3 D_3 + B_4 X + B_5 (D_1 X) + B_6 (D_2 X) + B_7 (D_3 X) \]

The group vectors were described by the A and B coefficients in the equation. The specific vectors are specified by the following equations:

- \( Y'a = A + B_4 X \) reference category for the regional campuses 1971
- \( Y'b = (A + B_1) + (B_4 + B_5) X \) for Columbus campus 1966
- \( Y'c = (A + B_2) + (B_4 + B_6) X \) for Columbus campus students in 1971
- \( Y'd = (A + B_3) + (B_4 + B_7) X \) for regional campuses 1966

In manipulating the data in this problem two regression problems with a total of four regression solutions were developed. Included for analysis were the following regression solutions: a simple regression solution using ACT scores as a predictor of senior level grade point average and a multiple regression with hierarchial inclusion which yielded first a regression for campus and year of entry.

\[ ^{19} \text{Ibid., p. 382.} \]
groups, second a saturated regression solution for both Act scores and the dummy variable categories, and finally an interaction solution for the two variables.\textsuperscript{20}

First, a regression equation was developed for ACT score of the entire population as it is used as a predictor of senior level grade point average. The results of this procedure are listed in Table 13. In this simple regression procedure a multiple R was found of .248 which yields an $R^2$ value of .062. This indicates that ACT score, the achievement measure collected before the student's entry into the University, explains 6.2 per cent of the variance in senior level grade point average. The direction of the relationship, as determined by the sign of multiple R, is positive which indicates that as ACT scores increase the predicted grade point average will also increase.

Because of difficulties in projecting relationships when scales of dependent and independent variables differ, it was helpful to examine beta weights. Beta co-efficients describe the regression co-efficients in standardized terms, hence the A co-efficient becomes zero and beta describes change in $Y'$ with one standard deviation change in $X$. Therefore, when ACT is used alone as a predictor of senior

\textsuperscript{20}Ibid., pp. 382-383.
TABLE 13
BI-VARIATE REGRESSION OF SENIOR GRADE POINT AVERAGE ON ACT COMPOSITE SCORE

<table>
<thead>
<tr>
<th>Multiple R</th>
<th>Analysis of variance</th>
<th>DF</th>
<th>Sum of square</th>
<th>Mean square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.24825</td>
<td>Regression</td>
<td>1</td>
<td>3.74011</td>
<td>3.74011</td>
<td>17.40370</td>
</tr>
<tr>
<td>0.06163</td>
<td>Residual</td>
<td>265</td>
<td>56.94933</td>
<td>0.21490</td>
<td></td>
</tr>
</tbody>
</table>

Adjusted R square 0.05809

Standard error 0.46358

Dependent variable--senior level grade point average

Independent variable--ACT score
level grade point average, for each increase of one standard deviation of ACT scores an increase of .248 standard deviations will occur in grade point average scores.

The standard error of estimate .464 indicates that approximately 68 per cent of the scores of the population will be within the range of the predicted score, $Y' \pm .464$.

The F ratio, or test of goodness of fit, of 17.40 at 1 and 265 degrees of freedom, is significant beyond the .001 level, which indicates that it is highly unlikely that the relationship specified in this regression problem is drawn from a population where multiple R for ACT and senior level grade point average is equal to zero.

The second regression procedure involved solution of a problem for the effect of group membership by use of dummy variables, a saturated model for the combined effect of group membership and ACT composite scores, and a measure of interaction between the two independent variables through the use of a multiplicative interaction term.

The effect of group membership on year and campus of entry groups in this study was explained in the first step of this analysis (Table 14). As noted previously, these groups were coded as dummy variables. The major emphasis in this analysis was on the overall effect of the three dummy variables as they were added as predictor variables in the equation. The overall F of 2.723 at three and 263 degrees
<table>
<thead>
<tr>
<th>Table 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>MULTIPLE REGRESSION OF SENIOR LEVEL GRADE POINT AVERAGE ON CAMPUS AND YEAR OF ENTRY GROUPS</td>
</tr>
</tbody>
</table>

Dependent variable--grade point average

Independent variables--Columbus 1966
Columbus 1971
Regional campuses 1966

<table>
<thead>
<tr>
<th>Multiple R</th>
<th>Analysis of variance</th>
<th>DF</th>
<th>Sum of squares</th>
<th>Mean square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.17372</td>
<td>Regression</td>
<td>3</td>
<td>1.83154</td>
<td>0.61051</td>
<td>2.72802*</td>
</tr>
</tbody>
</table>

R square 0.03018
Adjusted R square 0.01912
Standard error 0.47307

VARIABLES IN THE EQUATION

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Beta</th>
<th>Standard error B</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus 1966</td>
<td>-0.2348949</td>
<td>-0.23160</td>
<td>0.08225</td>
<td>8.155*</td>
</tr>
<tr>
<td>Columbus 1971</td>
<td>-0.1554739</td>
<td>-0.15143</td>
<td>0.08299</td>
<td>3.510*</td>
</tr>
<tr>
<td>Regional campuses 1966</td>
<td>-0.1579739</td>
<td>-0.12064</td>
<td>0.09773</td>
<td>2.613*</td>
</tr>
<tr>
<td>Constant</td>
<td>3.177735</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*significance level .05
of freedom was significant beyond the .05 level (Table 14). The overall relationship is, therefore, likely to be that found in the populations sampled in this analysis. The $R^2$ of .030, while small, is indicated as a significant portion of the variance accounted for in group membership information.

Each dummy variable in the multiple regression is indicated by a vector which in effect describes the mean scores of the groups. B weights, unstandardized regression co-efficients, are computed and tested for significance. In the case of the three dummy variables entered alone in the equation, the three regression co-efficients themselves are significant beyond the .05 level.

In step two of this problem (Table 15) the co-variate, ACT score, was added to the analysis in order to obtain an analysis of the predictive ability of the campus and year of entry of the subjects as well as the students' ACT scores.

The overall F test for the saturated regression equation of 6.88 is significant beyond the .01 level and indicates that we significantly improve our ability to predict grade point average when the saturated model is used. The $R^2$ in the analysis of .095 indicates again that the portion of variance accounted for in this equation is small although still significant.
TABLE 15
MULTIPLE REGRESSION OF SENIOR LEVEL GRADE POINT AVERAGE ON YEAR AND CAMPUS OF ENTRY GROUPS AND ACT SCORE

<table>
<thead>
<tr>
<th>Independent variable added on this step--ACT score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
</tr>
<tr>
<td>R square</td>
</tr>
<tr>
<td>Adjusted R square</td>
</tr>
<tr>
<td>Standard error</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VARIABLES IN THE EQUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Columbus 1966</td>
</tr>
<tr>
<td>Columbus 1971</td>
</tr>
<tr>
<td>Regional campuses 1966</td>
</tr>
<tr>
<td>ACT score</td>
</tr>
<tr>
<td>Constant</td>
</tr>
</tbody>
</table>

**significance level .01
The saturated regression model used in Step 2 assumes equal effect of the co-variante on each of the nominal factor groupings. In order to test this assumption the interaction between these two terms must be tested.

In order to test the interaction, multiplicative terms are added in which dummy variable scores (1 and 0) are multiplied by the paired co-variante score for each subject. These terms are added to the regression equation in the third step. (Table 16).

The primary focus of this level of analysis is the analysis of variance portion of the regression output table. The overall F for interaction in the analysis of co-variance was found to be 5.60. At 7 and 259 degrees of freedom a table value beyond the .01 level was found, which indicates that the effects of the co-variante differ across the dummy variable groups.

The $R^2$ value of .13 could be considered to be significant but as Kerlinger and Pedhazur have noted, this value should be treated with caution due to the very high correlation between the interaction term and terms already in the equation.\(^{21}\)

TABLE 16
MULTIPLE REGRESSION OF SENIOR LEVEL GRADE POINT AVERAGE ON CAMPUS AND YEAR OF ENTRY GROUPS, ACT SCORES AND MULTIPLICATIVE INTERACTION TERMS

Dependent variable--grade point average

Independent variables added on this step--Columbus 1966 X ACT score
Columbus 1971 X ACT score
Regional campuses X 1966 ACT score

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Beta</th>
<th>Standard error</th>
<th>B</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus 1966</td>
<td>0.1741832</td>
<td>0.01717</td>
<td>0.45041</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Columbus 1971</td>
<td>-0.9147768</td>
<td>-0.89098</td>
<td>0.41028</td>
<td>4.971</td>
<td></td>
</tr>
<tr>
<td>Regional Campuses 1966</td>
<td>0.1929662</td>
<td>0.14736</td>
<td>0.46796</td>
<td>0.170</td>
<td></td>
</tr>
<tr>
<td>ACT score</td>
<td>0.2118138</td>
<td>0.19441</td>
<td>0.01404</td>
<td>2.277</td>
<td></td>
</tr>
<tr>
<td>Regional campuses 1966 X ACT score</td>
<td>-0.1503433</td>
<td>-0.26359</td>
<td>0.02020</td>
<td>0.554</td>
<td></td>
</tr>
<tr>
<td>Columbus 1966 X ACT score</td>
<td>-0.1113638</td>
<td>-0.26282</td>
<td>0.01907</td>
<td>0.341</td>
<td></td>
</tr>
<tr>
<td>Columbus 1971 X ACT score</td>
<td>0.3343279</td>
<td>0.76651</td>
<td>0.0172</td>
<td>3.643</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.689365</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Summary

In summary, the statistical analysis in problem four indicated that while both campus and year of entry information and ACT scores have a significant effect in predicting grade point average, the amount of variance accounted for is quite small. Data presented in Table 17 summarizes the data analysis for the second regression problem. In the saturated model the dummy variables representing campus and year of entry information generated an $R^2$ changed value of .030 when combined in the hierarchial regression equation. The ACT score information added .065 to this $R^2$ as it was added to the equation, yielding an $R$ square at that point of .0950. While these values were found to be significant as noted above, the amount of variance accounted for in the equation is small. A significant interaction was found indicating differences in the effect of ACT score over categories.

SUMMARY OF FINDINGS

In this chapter four statistical procedures were outlined which addressed the problem statement outlined in chapter one. Campus and year of entry groups were analyzed first in a comparison of ACT scores. The overall main effect of the ANOVA problem was significant and the interaction effect of the factors campus and year of entry was also significant. Graphic interpretation of the interaction
### TABLE 17

**SUMMARY TABLE FOR MULTIPLE REGRESSION ANALYSIS OF SENIOR LEVEL GRADE POINT AVERAGE ON CAMPUS AND YEAR OF ENTR Y AND ACT SCORE**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Multiple R</th>
<th>R square</th>
<th>R square change</th>
<th>Simple R</th>
<th>B</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus 1966</td>
<td>0.12311</td>
<td>0.01516</td>
<td>0.01516</td>
<td>-0.12311</td>
<td>0.1741832</td>
<td>0.01717</td>
</tr>
<tr>
<td>Columbus 1971</td>
<td>0.14333</td>
<td>0.02054</td>
<td>0.00539</td>
<td>-0.00610</td>
<td>-0.9147768</td>
<td>-0.89098</td>
</tr>
<tr>
<td>Regional campuses 1966</td>
<td>0.17372</td>
<td>0.03018</td>
<td>0.00964</td>
<td>-0.00616</td>
<td>0.1929662</td>
<td>0.14736</td>
</tr>
<tr>
<td>ACT score</td>
<td>0.30826</td>
<td>0.09502</td>
<td>0.06485</td>
<td>0.24825</td>
<td>0.2118138</td>
<td>0.19441</td>
</tr>
<tr>
<td>Regional campuses 1966 ACT score</td>
<td>0.32290</td>
<td>0.10426</td>
<td>0.00924</td>
<td>-0.00043</td>
<td>-0.1503433</td>
<td>-0.26359</td>
</tr>
<tr>
<td>Columbus 1966 ACT score</td>
<td>0.34540</td>
<td>0.11930</td>
<td>0.01504</td>
<td>-0.11230</td>
<td>-0.1113638</td>
<td>-0.26282</td>
</tr>
<tr>
<td>Columbus 1971 ACT score</td>
<td>0.36265</td>
<td>0.13151</td>
<td>0.001221</td>
<td>0.06681</td>
<td>0.3343279</td>
<td>0.76651</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.689365</td>
<td></td>
</tr>
</tbody>
</table>

112
showed a slight convergent trend between Columbus and regional campus mean ACT composite score means over the two years 1966 and 1971. Post hoc analysis, using the Fisher LSD procedure, showed a significant difference beyond the .10 level between regional campuses and Columbus campus in 1971.

Problem two outlined the relationship between year and campus of entry and attrition-retention ratios. A significant relationship was found between campus of entry and attrition in both years included in the study. For regional campus students a significant relationship was found between year of entry and attrition-retention ratios. Finally, in an analysis of Columbus campus attrition-retention information by year, chi-square was found to be non-significant indicating that the results shown in the table may be due to chance rather than actual difference.

Biserial r was applied to the ACT score and attrition-retention data in problem three. All groups included in the study generated significant biserial r values. This indicated differences between attrition and retention groups on ACT scores.

Problem four examined the independent and combined effect of campus and year of entry into the university and ACT composite score on senior level grade point average. Both entry group and ACT score yielded significant
multiple-R and R-square values. The combined effect of entry group and ACT score was also significant.
CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Chapter four begins with a summary of the problem statement and related methodology and continues with a summary of the study, conclusions and recommendations.

PROBLEM STATEMENT AND METHODOLOGY

The study, as proposed, outlined a comparison of students entering The Ohio State University as freshman during fall quarter 1966 and 1971. In each year students from the University's campuses at Columbus, Lima, Mansfield, Marion, and Newark, Ohio were to be sampled in two groupings: those entering as new first quarter freshman at the Columbus campus and those entering as new freshman at the regional campuses. Four problems were outlined in the form of a series of questions.

Problem one asked for comparisons of American College Test mean composite scores at regional and Columbus campuses during the specified years.

Problem one

A. Is there a difference in the American College Test composite score profile between the class of new
first quarter freshmen entering The Ohio State University regional campuses during fall quarter 1966 and those entering fall quarter 1971? 

B. Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State University at the Columbus campus during Fall quarter 1966 and those entering in Fall quarter 1971? 

C. Is there a difference in the American College Test composite score profile between the class of new first quarter freshmen entering The Ohio State University during Fall quarter 1971 at the Columbus campus and those entering regional campuses in 1971? 

Methodology for problem one involved a two part solution. First, a two factor factorial analysis of variance was performed using campus of entry (Columbus or Regional Campus) and year of entry (1966 and 1971) as factors. A significant main and interaction effect were found and post hoc analysis was performed using Fisher's Least Significant Difference (LSD) test. 

Problem two sought to determine the relationship between the campus and year of entry groups concerning attrition and retention.
What is the relationship between the attrition rates of the campus entry groups included in the study (Columbus 1966, Columbus 1971, regional campus 1966, and regional campus 1971)?

Methodology for problem two involved the computation of four separate chi square statistics for the four two-by-two contingency tables indicated in the problem statement.

Problem three: What is the relationship between the groups of students defined as attritions and those defined as retentions at The Ohio State University when compared on ACT composite score measures for each campus and year of entry described in the study?

The analysis of problem three involved the use of biserial r an estimation of Pearson's R for groups in which a dichotomized variable is assumed to have an underlying normal distribution and is used in combination with a normally distributed variable. In this case attrition and retention are assumed to have an underlying normal distribution in which the achievement of students within the groups varied and ACT score was considered a normally distributed variable. Correlation estimates were calculated for the four groups discussed in problems one and two.

Problem four: What are the independent and combined effects of ACT composite score and campus and year of entry
on the senior level grade point average of students in study who graduated from the University?

The methodology for problem four involved a special case of regression methodology in which both continuous (ACT scores) and categorical (campus and year of entry groups) variables were used as predictor variables. In this case an analysis of covariance approach to the regression problem involved the determination of the independent effects of ACT scores and the independent effect of campus and year of entry on senior level grade point average. In addition, a combined effect of ACT score and campus and year of entry groups was found through a saturated regression equation. Finally, an interaction solution examined differences in the effect of the continuous variable over the four dummy variable groups.

Summary

The study was organized in four chapters. Chapter one introduced the study and detailed the background and history of The Ohio State University and its regional campuses. Emphasis in that discussion centered on the development of regional campuses from their initiation as evening credit centers operated in local high school buildings to the present full day scheduling in separate campus facilities. The development of a resident teaching faculty and the degrees and academic ranks of these facilities was discussed.
The development of the campuses in the areas of physical facilities and full time tenurable faculty served as a background to the problem statement.

Chapter two reviewed the literature concerning two year campuses, similar to The Ohio State University Regional Campuses. Other topics included in the review as they related to the topics of academic aptitude, attrition, and grade point average in the study were: selection, reputation and hierarchy of institutions; dropout from higher education; commuter vs. resident students; the decline of college admissions test scores; articulation and transfer of students; political issues at two year campuses; and historical issues at The Ohio State University.

RESULTS

Problem one analyzed differences in the ACT composite score profile between campus and year of entry groups. The first step in the analysis involved a two factor factorial analysis of variance with campus of entry groups (Columbus-Regional Campus) and year of entry (1966, 1971) as factors and ACT scores as criterion variable.

In the first step of the analysis the F measure for overall main effects was significant. F in this case measures differences between at least two cells in the design. The effect of year of entry as a variable was not significant when campuses of entry were pooled. In the main
effects measure the effect of the variable campus was significant which is indicative of differences between the regional campus and Columbus campus groups when year of entry groups were pooled.

An interaction was found between campus and year of entry groups that was significant beyond the .05 level, indicating an effect of the two variables in combination beyond that found in main effects. Graphic interpretation of this interaction between campus and year of entry group means indicated a slight drop in ACT scores on the Columbus campus and a slight rise in scores in the regional campus groups over time.

The significant measure in the ANOVA procedure indicated that post hoc tests in the form of Fisher's Least Significant Difference (LSD) test could be properly used. These tests were performed on the comparisons of mean scores found for the grouped regional campuses in 1966 and 1971 and Columbus campus in 1966 and 1971. The differences between mean scores were not significant for the least significant difference at the .10 level. The difference between mean scores of students entering the University in 1971 at Columbus campus and at regional campuses was significant (at LSD .10) with Columbus campus mean being 21.70 and regional campuses at 20.89.
Problem two analyzed the relationship between campus and year of entry and attrition-retention data collected six and one half years after the point of entry for both freshman classes included in the study. Attritions were defined as all those not enrolled in a degree-granting college of The Ohio State University at the time of date-collection who had not received a baccalaureate degree.

The first analysis included the campuses of entry and attrition-retention data for each year included in the study. In both cases chi square was significant, revealing that the relationships specified in the table were significantly different from random probability. In the case of 1966, Columbus campus generated a 50 per cent retention rate and regional campuses a 25 per cent retention rate. For the 1971 class Columbus had a 48 per cent retention rate and regional campuses a 34 per cent retention rate.

In the second analysis the Columbus and regional campus groups were separated and the contingency table was constructed by year and attrition and retention. In the case of Columbus campus chi square was non-significant at .160 indicating that the relationship included in the table, 50 per cent retention for 1966 and 48 per cent for 1971, could have been the result of random probability. For regional campuses the chi square relationship was significant at the
.05 level, indicating the high probability of a correlation between year of entry at a regional campus and attrition.

In problem three the analysis concentrated on comparisons of those counted as attritions and retentions in problem two by ACT composite score. Differences were found between these groups for each campus and year of entry group included in the study through the use of biserial r. Standard errors and significance levels were calculated for each group, and all biserial r calculations were found to be significant beyond the .05 level. This result indicates that differences existed between those counted as attritions and those counted as retentions when compared by ACT mean composite score for all groups included in the study.

Problem four asked that the independent and combined effects of ACT composite score and campus and year of entry be determined. An analysis of covariance approach to multiple regression analysis was used in a four step procedure. First the independent effect of ACT score on senior level grade point average was determined. Second, the effect of dummy variables representing campus and year of entry was determined. In the third and fourth steps a saturated regression equation including ACT score and dummy variables groups and an interaction solution determining the effects of ACT score across the dummy variable groups were developed.
In problem four significant multiple R (.48 and $R^2$ (.062) values were found for ACT score as a predictor of senior level grade point average. The data on group membership (campus and year of entry) yielded an $R$ square value of .030 which was significant, indicating that a significant amount of variance in senior level grade point average was accounted for in group membership. In the final step of the regression analysis an analysis of covariance approach to the regression problem was used. A significant interaction was found in that the effect of the covariate differed across the campus and year of entry groups. Post hoc analysis was not completed due to the limited amount of variance accounted for by the regression analysis.

CONCLUSIONS

Analysis of ACT Scores by Campus and Year of Entry

The significant overall F and main effects measure for campus indicated differences between at least two cells in the factorial design.

Subsequent post hoc analysis indicated that of the three specified post hoc analyses, only one, that between Columbus 1971 and regional campuses 1971, was significant.

Coupled with Vaughn's study of the entire population of entering freshmen, in which he found differences between regional campus students and Columbus campus students in the 1966 entering class of new first quarter freshmen, we can
say that there was a high probability that differences existed between regional and Columbus campus students in ACT composite score in both years.

This result indicates that in the two years studied significant differences existed between students entering the University at regional and Columbus campuses. Astin has suggested that the entering class of an institution has an effect on the students in an institution (see chapter two). In effect the level of competition at Columbus and regional campuses may have differed in both years included in the study. This result then may have an effect on subsequent analyses in problems two and four. It is possible that attrition and other factors may be affected more by the difference in ACT scores than by other factors which will be discussed.

The significant interaction measure was the most interesting result of the procedure for the writer. As noted earlier, this measure indicated that a graphic presentation of the results would result in non-parallel configuration when ACT composite score means were graphed by campus across the two years studied.

The interaction measure and subsequent graphic illustration show a slight rise in the mean score of regional campus students and a slight decline in the mean score of
Columbus campus students when the results of the analysis of ACT composite scores were graphed.

Coupled with the findings in main effects, we can state that while the gap between regional campus and Columbus campus students appeared to be narrowing, a significant difference still existed between the two groups in 1971.

The Columbus campus, as shown by the interaction measure, seems to be following a national trend for American College Test scores. As noted in chapter two the national trend in ACT scores is for a slight decline which has persisted over a long period of time.¹

Interestingly, the regional campus results indicate a trend which is opposite that of Columbus and the national trend. This slight rise was not considered significant, but as part of the interaction measure, the effect of campus and year together (beyond main effects) was significant. In speculating on how this result might be explained the reader is directed to chapter two and the section entitled "Decline of the College Admission Test Scores" for complete analysis of the literature concerning this issue.

This section, as well as "Selection, Reputation, and the Hierarchy of Institutions" (also in chapter two), outlined the institutional characteristics which attract

¹Munday, Declining Admissions, p. 5.
students to colleges and universities. Blau, in particular, noted that the quality of the student body is related to reputation of the institution among more able students, faculty salaries, faculty qualifications, and the appearance of affluence.²

As noted in the background statement, the development of the faculties of the regional campuses accelerated during the interim between the periods under study. Percentages of doctoral degrees, and ranks of the faculty and percentage of faculty on full-time appointment (at some campuses) increased through the period studied.

In addition, the physical development of the campus settings and the creation of the name regional campus occurred during this period. By 1971 all regional campuses had moved to permanent campus facilities and full time day and night programming became a possibility.

The developments mentioned here relate to Blau's research and may be related to the non-conformity of the regional campuses in relation to national trends for the decline of ACT scores. If the regional campuses had maintained what might be called a steady state normatively, the scores of regional campus students should have declined slightly as was the case in Columbus. However, the regional

²Blau, The Organization, pp. 88, 43.
campuses did in fact oppose both national and Columbus campus trends with the slight increase shown in the interaction measure.

The data do not specifically speak to this issue, however, given the clear statement of research in the area, we may hypothesize that a relationship does exist between the development of the regional campuses and the change in the ACT score relationship shown in the interaction measure. This issue will be addressed in the implications section.

Attrition and Retention

The second problem in the analysis dealt with the attrition of the students included in the four groups studied. Attritions were defined as any student who had not completed a baccalaureate degree and was not currently enrolled in a degree-granting college of The Ohio State University six and one half years after his/her entry into the University. Three of the analyses of attrition-non-attrition proportions by chi square analysis were significant.

In the 1966 and 1971 entering classes the relationship between Columbus students and regional campus students was significant when the proportions of students counted as attritions and retentions were entered in chi square contingency tables. The Columbus campus sample entering in 1966 had a 50 per cent attrition rate while the regional
campus sample had approximately a 75 per cent attrition rate. The 1971 entering class yielded attrition rates of 48 per cent for Columbus and approximately 67 per cent for regional campuses.

In an extension of the analysis chi square contingency tables by campus were constructed in order to compare the years of entry for each campus group. For the Columbus campus, when attrition data were entered by year, the relationship between 1966 and 1971 attrition data was non-significant. This would indicate that the relationship depicted in the table could likely be the product of chance. The two attrition rates, 50 per cent in 1966 and 52 per cent in 1971, are quite similar.

In the comparison of the two years of entry for regional campus students on attrition proportions the chi square was significant. The percentage of attritions dropped from 75 per cent for 1966 freshmen to 67 per cent for 1971 freshmen.

The rough equivalence of the attrition percentages for the Columbus campus for the two years is an indication of a steady state in Columbus with respect to attrition. Variation in the regional campus proportions of attritions is indicative of changes in the regional campuses themselves.

As noted earlier in this chapter and in chapter one, the regional campuses were in the process of developing
traditional college faculties, facilities and programs during the period. Full time faculty members and academic advisement staffs were available to students who were able to schedule a full load of courses during the traditional daytime hours.

These factors and other developments noted earlier suggest that the body of literature concerning dropout in higher education may be applicable. The analysis of Astin in chapter two provides the best summary of studies in this field in his statement of involvement theory.

Involvement theory as outlined by Astin indicates that the tendency to drop out is inversely related to the degree of involvement in the academic and social life of the institution. Involvement in the academic life of the institution takes precedence over social life.3

The writer would argue that in the development of the regional campuses during the time studied the potential for student involvement increased by the development and change in the regional campuses. Primary support for this statement comes from the development of the regional campuses themselves. Logically, the primary means for developing potential for student involvement comes from the development of the campus faculties. Between the two years the

3Astin, Preventing, p. 171.
faculties of the three regional campuses answering a survey summarized in Table 1 grew from 70 full time members to 117. Dramatic increases also occurred in the professional ranking of these faculties Table 3 (Chapter one). The development of full time resident faculty members and the movement of the programs to separate campus faculties allowed for office conferences and informal contact which was impossible when classes were held in rented or borrowed facilities in the afternoon or evenings only.

In addition, the development of full day scheduling allowed for the development of campus activities and academic advisement staffs. We would argue that these developments would allow for more complete involvement of students and particularly that they served to make the regional campuses more similar to Columbus and a traditional college environment.

In both the analysis of ACT scores and in the analysis of attrition information Columbus campus students appear to have higher ACT scores and lower attrition rates than regional campus students. The interaction effect in the analysis of variance and the change in regional campus students and their attrition pattern may be taking place.

These two developments may be related. Columbus campus experienced a slight but not significant drop in ACT scores. It is interesting to note that there was also a slight drop
in the retention rate. While the data are not conclusive we may say, however, that these developments could be related.

Likewise in the case of regional campuses, a slight but non-significant increase in ACT mean composite score was found. The difference in attrition rates for the same students was much larger, suggesting that factors other than the slight change in ability level as indicated by ACT score may be involved in the change.

The attrition rate may also be related to developments which were outlined in chapter two concerning historical issues in comparing these two classes. This section outlined the history of student demonstrations at The Ohio State University and the selective service draft for the armed forces. It would seem that the societal pressures outlined in that section would have impacted on all campuses in a similar way. However, the fact that demonstrations occurred mainly if not solely on the Columbus campus may have caused some students and their parents to react by choosing a regional campus location at Ohio State rather than the Columbus campus. It is possible that such decisions were made and if so these decisions may have, in effect, confounded the comparisons of 1966 with 1971 particularly on regional campuses.

Other changes outlined as historical issues were the liberalization of the dismissal rule for freshmen, the
development of pass/non-pass option for undergraduate students, and the implementation of satisfactory-unsatisfactory grading for individual investigation courses for undergraduates. These changes in academic rules applied equally at all campuses. The effect of these changes is difficult to determine. While the data collected for this study were not intended to test the effect of these issues, the relationship between the two entering classes in Columbus may serve as a control. The relative lack of change in ACT scores and attrition rates may indicate the relatively minor effect of the historical issues cited. The inclusion of the Columbus sample was initially done to serve as a control group for overall change in the environment or policies of The Ohio State University.

These limitations and variations seem to have minimal effect, the change in attrition rate at regional campuses should be assessed as a significant educational advancement for branch campus education at Ohio State.

Extrapolation beyond the data is risky in this case because there are factors involved in this situation which may limit the amount of change regional campuses may make in relation to the Columbus campus. Astin and others note a break in attrition rate and standardized test scores between two year and four year colleges (Chapter two). In comparisons between Columbus and regional campuses this primary
The more striking difference between the two groups is the difference in attrition rates between Columbus campus and regional campus students in the two years studied. It is highly unlikely that this gap will narrow to a point of equality over time. Astin and Chickering both emphasize the differences in the involvement between commuter and resident students and the outcome of the lack of involvement in higher attrition rates for commuter students (Chapter two). Given the commuter nature of the regional campuses, differences in attrition rate are likely to continue.

Another factor involved in the institutional attrition rate for regional campus students is the point of change between campuses. Columbus campus students after the completion of two years continue without a change in location or other break in education. Most regional campus students must change campuses at the end of two years and in most cases residences as well.

This change involves several inconveniences which may encourage attrition. The transfer to Columbus may be difficult because of potential increase in the out-of-pocket costs for education, family disruptions, need to continue
work or find another job and other considerations. In addition, some students may use the logical break to re-assess educational plans and consider institutions other than The Ohio State University in making decisions concerning the choice of a campus for the completion of a baccalaureate degree program.

Relationship Between ACT Score and Retention

All cell groupings in the design had significant measures of relationship on biserial $r$. This indicates that a relationship did exist between American College Test composite score and retention. The relationship was positive in each case, indicating that ACT score is a predictor variable for retention. This result is what would have been predicted given the extensive scholarship concerning the predictive ability of the American College Test.

Biserial $r$ is an estimation of the Pearson product-moment calculation. As an estimator, the results of the procedure are not considered to be useful in post hoc analysis. Because of this no post hoc comparisons of correlations were performed.

The rank order of the strength of relationship of the biserial $r$ co-efficients is listed below.
BISERIAL $r$ CORRELATION FOR ACT SCORE BY 
CAMPUS AND YEAR OF ENTRY

<table>
<thead>
<tr>
<th>Campus and year of entry</th>
<th>Biserial $r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbus 1966</td>
<td>.47</td>
</tr>
<tr>
<td>Regional campuses 1971</td>
<td>.37</td>
</tr>
<tr>
<td>Regional campuses 1966</td>
<td>.31</td>
</tr>
<tr>
<td>Columbus 1971</td>
<td>.21</td>
</tr>
</tbody>
</table>

The disparity indicated between Columbus campus 1966 and 1971 is interesting and may be due to peculiarities within the populations. If so, these peculiarities were not evidenced in the overall statistics concerning those groups. The difference in ACT composite score in the post hoc pairwise analysis in problem one was not significant and the attrition rates were roughly equal.

The disparity in the two also indicates a relatively weak relationship between ACT scores and attrition for Columbus 1971. This is supported in the significance levels discussed in chapter three in that Columbus 1966 was significant at the .05 level and the other groups with relatively stronger relationships yielded significance levels of .01 and beyond.

The results of this analysis are otherwise uniform and not surprising in that the finding supports a large body of
research. This research indicates that ACT score is a reliable and valid measure of scholastic achievement related to success in higher education.

**Analysis of ACT Score and Campus and Year of Entry as Predictors of Senior Level Grade Point Average**

In problem four, the first computation of bivariate regression on ACT score, a significant overall $F$ for the multiple $R$ was found. Multiple $R$ was .24825 (significance level .001). This indicates that ACT score is a significant predictor of the senior level grade point average of students included in the study.

The $R$ square value of .0616 indicates a rather small amount of variance explained by ACT score alone. There are reasons for this which have been discussed in earlier chapters. ACT is primarily and best used in predicting freshman grade point average rather than senior level grade point average. This regression solution indicates that while at the senior level ACT is a significant predictor of grade point average, the relationship is somewhat weak.

When group membership by campus and year of entry was entered into a second regression equation a significant $R$ square of .030 was found (significance level .05). As in the case of ACT composite score, the relationship is considered significant but the amount of variance explained by $R$ square, 3 per cent, is quite small. In effect, while we
increase our knowledge and reduce errors of prediction when we include knowledge about a student's campus and year of entry, we do not explain a large portion of the variance in senior level grade point average.

The saturated model in which ACT and the dummy variables are included in the same step yielded an R square value of .095 and a significance level of .01. At this point individual unstandardized regression co-efficients (B values) began to be found to be non-significant. Regional campuses 1966 with a B value of -.138 and F value of 2.139 was not significant at the .05 level. As noted in chapter three this may be due to the high correlation with the reference category regional campuses 1971.

The saturated model for dummy variables and a single continuous variable assumed that the effect of the continuous variable was constant. In order to test this assumption an interaction term was added to the regression equation in order to complete an analysis of co-variance with a regression approach. The results of this procedure indicated a significant difference between groups in the effect of the continuous variable. Ordinarily this result would be followed by post hoc analysis. Several reasons will be given for not conducting such an analysis.

In the interaction regression solution individual unstandardized regression co-efficients were computed for
the dummy variables, ACT scores and interaction terms. The only significant B weights in the analysis were Columbus 1971 among dummy variables, ACT scores, and the interaction term associated with these two, regional campus 1971 multiplied by ACT score. Because this result is not in line with the other groups, a frequency distribution was performed for Columbus 1971 ACT scores. The frequency distribution for Columbus campus 1971 ACT scores is markedly skewed to the high end. This non-normal distribution of ACT scores may be responsible for the significance of the b co-efficients associated with this group.

All other B weights were found to be non-significant at the .05 level.

Table 17 (Chapter three, p. 112) presents the summary table for the saturated model plus interaction solution of regression of all factors. The stepwise analysis summarized in this table shows the low overall percentage of variance explained by each variable in the regression solutions. The primary purpose in the regression analysis was oriented toward finding differences between campus and year of entry groups. The low R square values for the dummy variable groups were a primary reason for not completing the Johnson-Neyman technique to determine regions of significance in post hoc analysis. Kerlinger and Pedhazur note that when $R^2$
is significant and the amount of variance accounted for is low the analysis should be terminated at that point.  

The important result of this procedure is, in effect, the low R square for campus and year of entry dummy variable groups. The low variance accounted for is in effect a positive argument for the regional campus system.

The intention of problem four was to develop some comparative measure between Columbus and regional campuses which might indicate relative advantages to students in starting at regional campuses or at the Columbus campus. In effect, the problem served as a way of determining whether students at regional campuses scored lower on senior level grade point average than those who started in Columbus.

The research cited in chapter two indicated that quality of student body was a major factor in the success of students regardless of ability. Related research noted that quality of student body was related to the reputation of the institution among more able students, faculty salaries faculty research productivity and the appearance of affluence.

Astin and Chickering both pointed to the relative disadvantage which commuter students had in relation to their counterparts who did not live at home while attending college (See chapter two).

\footnote{Kerlinger, \textit{Multiple Regression}, pp. 258-259.}
All of these statements might lead to the conclusion that regional campus students would fare poorly in comparison to their Columbus campus counterparts.

The results however indicate that only three percent of the variance in senior level grade point average is accounted for by campus and year of entry information. The results of the regression procedures are additive. ACT score alone when entered in the regression equation yielded a percentage of variance explained of 6.2 per cent. The saturated regression solution resulted in 9.5 per cent of variance explained or an increase of 3 per cent in addition to that accounted for by the variables alone.

The fact that the results did not justify post hoc analysis is important in itself. The differences between the campus and year of entry groups were not sufficient to allow the development of regions of significance and graphic interpretation of difference between vectors.

We can conclude then that while the dummy variable groups added significantly to the prediction of senior level grade point average the amount of variance accounted for was quite small, eliminating the possibility comparisons between groups.

The result of the interaction procedure that the effect of the covariate ACT score differed, is important but cannot be adequately discussed because of the lack of post hoc
analysis. This result will however be discussed in implications for future research.

The results outlined in this section point to a specific result which may be the most important aspect of the study. If a major amount of variance had been due to a student's campus and year of entry we would have had a de facto argument against the University's and in particular the regional campuses' claims to full articulation. The claims outlined in chapter one emphasized that The Ohio State University as an undergraduate institution was one fully articulated body operating on five campuses. Implicit in this claim is the notion that regardless of campus attended a given student will receive equal benefit from experiences at The Ohio State University. This claim might have been subject to questions had campus and year of entry been found to be a major force in predicting senior level grade point average.

IMPLICATIONS FOR FUTURE RESEARCH

Data reported in this study point to a change in the conditions under which regional campus education programs have been conducted. The changes in location, timing, and faculty qualifications were outlined in chapter one. Parallel changes in attrition rate and other measures were outlined in chapter three. In addition we have cited in chapters two and four several authorities who supported the
notion that institutional characteristics and other factors which affect environment are related to characteristics of student body and student attrition.

The data cited in chapter one Tables 1-3 suggest a trend in the development of regional campus faculties. The percentage of full-time faculty, tenured faculty, those counted as regular faculty (ranks assistant professor and above) and those with terminal degrees has increased. The question which we find pressing relates directly to these developments. Given continued development of faculty at regional campuses, are there related developments in the characteristics of students and their academic careers?

The study as noted earlier covers a period of rapid development at the regional campuses of The Ohio State University. The data cited in chapter one concerning faculty qualifications show that development of regional campus faculties increased over the five year period 1971-1976.

The present study could be seen as somewhat inconclusive in that although we found a trend in the qualifications of students in problem one through the ANOVA interaction, we found no significant differences in the comparisons of 1966 and 1971 students at regional and Columbus campuses. If the present study were expanded and the result in the interaction measure were indicative of a trend, a study of the 1976 entering class might result in more conclusive results.
Therefore, we recommend that this research be continued in five year intervals so that long term trends might be assessed.

In the review of literature chapter we cited political issues which have arisen periodically concerning the existence of a branch campus system in the state of Ohio. During the course of this study the Governor's Council for Cost Control released a document: "College: The Coming Crisis, an Analysis of How Major Trends in Ohio's Higher Education System Will Affect the Role of Two Year Colleges". As in past attempts to change the system the cost control council recommends the development of a network of state community and technical colleges. The proposed system, from the logic present in the document, would be oriented toward coordination of programs, elimination of program duplication, and increasing participation rates. Under this system universities would be stripped of branches and regional campuses and assume control of general and technical colleges as included in their newly defined districts.

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6Ibid., p. 13.
Under the proposed district system The Ohio State University would assume control of Columbus Technical Institute and the regional campuses would be included in other districts.\textsuperscript{7}

These recommendations seem curious in that the council itself lists quality of education as its first requirement and access as its second without further discussion or evidence of how either quality or access would be aided by its redistricting plan. No reference to data which might support the contention that access would be improved or quality maintained is made.

Ohio in the diversity deplored by the council is rich in the sense that it can make intelligent decisions in planning the future of its higher education system by examining the system it now supports.

We recommend that these issues be addressed in future research. This study compared campuses within The Ohio State University with respect to entry characteristics, attrition, and other measures. A similar study should be developed which would address similar issues from a system perspective. In lower division baccalaureate programs the state's two year campus and institutions could be assessed for the quality of student attracted and progress of students toward institutional and student objectives.

\textsuperscript{7}Ibid., p. 28.
The council defines the mission of a two year institution in the following way:

"....the two colleges would serve two purposes: providing specialized instruction leading to certification or an associate degree; and offering lower division courses with earned credits transferable to a university for persons seeking baccalaureates."\(^8\)

If one of the objectives of the proposed two year college system is to serve the needs of the state for lower division baccalaureate education, data should presently exist to test whether the assumption that this objective can be better achieved by a two year college system is true. Comparisons of participation and attrition in baccalaureate and baccalaureate parallel programs could easily be assessed if resources were devoted to the problem. Knoell and Medsker in data collected concerning articulation found that articulation problems between two and four year campuses were reduced in the case of The Pennsylvania State University, a similar institution to The Ohio State University, (see chapter two). Surely, before such a radical change in organization, data should be collected which might indicate whether such changes would be beneficial to the goals of the system.

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\(^8\)Ibid., p. 14.
In chapter two we noted the lack of research concerning branch and regional campuses in general. Additional research in other branch campus systems similar to The Ohio State University should be undertaken to determine whether the developments outlined in this study are limited to Ohio State or if they have been experienced at other institutions.

IMPLICATIONS AND RECOMMENDATIONS FOR ADMINISTRATIVE PRACTICE

Based in the analysis of the conclusion section and the implications for future research sections of this chapter the recommendation that The Ohio State University continue to maintain and develop its regional campus system is made. No data known to the writer suggest that separating the regional campuses from the University would increase access, reduce cost or increase the quality of education.

On the contrary, implicit in this study support exists for the continued development of the campuses, their faculties and programs. As the regional campuses have developed the quality of students seems to have increased and the attrition rate has fallen. While a causal relationship was not hypothesized nor argued, in concluding the study the investigator believes that a relationship may well exist between the development of the regional campuses and changes in the attrition rate in particular.
The development of state policy in Ohio seems to occur in the absence of data which might suggest that decisions are based in the needs of students. As noted in chapter two and in the preceding section on implications, recommendations seem to be based in arguments for cost efficiency or for increased access without regard to academic outcomes. The Board of Regents of The State of Ohio should devote resources to the development of an institutional research system which will discuss outcomes of education at particular types of institutions. The purpose of such a system could be that of developing a data base appropriate for academic decision-making to complement the well developed base for fiscal planning which now exists.
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