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DUDLEY, Frank Mayo, 1920—
THE RELATIONSHIP OF PREPARATION AND PROFESSIONAL STATUS TO THE DECISIONS OF SCIENCE TEACHERS.

The Ohio State University, Ph.D., 1962
Education, teacher training

University Microfilms, Inc., Ann Arbor, Michigan
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THE YEAR A DESIRED POSITION WAS OBTAINED
BY THOSE WHO TAUGHT

NUMBER OF YRS.

1ST YR. 16.67%
2ND YR. 21.67%
3RD YR. 11.67%
4TH YR. 6.66%
5TH YR. 5.0%
6TH YR. 1.67%
7TH YR. 3.33%
NEVER 25%
NO RESPONSE 6.66%

% OF THOSE
WHO TAUGHT

FIG. 17
two-thirds of the group which taught obtained the position which they desired most by the seventh year of teaching. The latter figure provides another way of presenting the data concerning the attainment of the desired position for the group which left teaching and the group which remained in teaching.

Reasons for Leaving Science Teaching

Attrition Factors: Methods of Presentation

The data collected concerning the reasons for leaving science teaching are in tabular form (Table 2) and in diagrammatic form (Figure 18). The tabular presentation was made in order to indicate the major factor which contributed to the graduates' leaving science teaching. These data were obtained by asking the graduate to answer "yes" or "no" to the question in which information was sought concerning the factor as the major influence in his leaving science teaching. The diagrammatic presentation was made to further clarify the specific attrition factors to which positive responses were made by the graduates. The total positive responses to these items were 36. The diagram indicates a percentage comparison of the positive responses for all the attrition factors.
General Effects of All Factors of Attrition on the Group Which Remained and the Group Which Left Teaching

Table 2 indicates that of the total number of respondents from the group which left teaching (the number of cases used in the table was 28 rather than the actual number, 29 who left teaching, because one respondent omitted this portion of the questionnaire), the greatest contributor to the attrition rate among this set of factors was the financial one. Of the factors to which the graduates reacted positively, those which contributed least to the attrition rate were community attitude and military obligation. The fact may be noted that the financial factor also showed the greatest number of "no responses." If the "no responses" correction method is applied to the "no responses" without expressing the corrected figure in a percentage, the figure for the affirmative responses becomes approximately fifteen plus responses. This figure is an increase of three over the figure appearing in the table. A greater difference occurs after the correction between the financial factor and the other factors than before the "no response" correction is made. The difference between the affirmative and negative responses in the financial category decreases after the correction for the "no responses" is made, resulting in 15 affirmative and 13 negative responses.
### TABLE 2

**DISTRIBUTION OF CASES AMONG MAJOR FACTORS CONTRIBUTING TO THE ATTRITION OF SCIENCE TEACHERS**

<table>
<thead>
<tr>
<th>Factor Category</th>
<th>Total</th>
<th>Yes</th>
<th>No</th>
<th>No Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial improvement</td>
<td>28</td>
<td>12</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Excessive teaching load</td>
<td>28</td>
<td>3</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>Poor administrative practices</td>
<td>28</td>
<td>9</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Faculty non-cooperation</td>
<td>28</td>
<td>3</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Community attitude</td>
<td>28</td>
<td>1</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>Family pressure</td>
<td>28</td>
<td>3</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Inadequate preparation</td>
<td>28</td>
<td>2</td>
<td>21</td>
<td>5</td>
</tr>
<tr>
<td>Mental health</td>
<td>28</td>
<td>2</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td>Military obligation</td>
<td>28</td>
<td>1</td>
<td>23</td>
<td>4</td>
</tr>
</tbody>
</table>
The Least Effective Attrition Factor

Table 2 also reveals that the only factor which received almost a unanimous negative response was excessive teaching load. In other words, the table indicates that three responses appeared in the affirmative column and no cases appeared in the "no response" category for this factor. The latter fact makes the negative responses all the more important. This fact is discussed in Chapter V.

Poor Administrative Practice: Attrition Effect

Poor administrative practice could be rated the second highest among the attrition factors. Only four "no responses" were listed for this factor, a number not sufficient to have changed the figures appreciably. An important fact to be pointed out is that some overlapping may occur between these factors in their effect upon the attrition rate. This overlapping effect would probably cause the respondent considerable difficulty in deciding which factor he believed to be largely responsible for his decision to leave science teaching. For example, inadequate preparation might be responsible for the graduate's inability to understand his failure to cope with problems involving faculty responsibility of an administrative nature. The graduate would therefore have difficulty
NINE CONTRIBUTING FACTORS FOR LEAVING SCIENCE TEACHING
(Based on Total Positive Responses)

- 33.33% Financial Improvement
- 8.33% Excessive Teaching Load
- 25% Poor Administrative Practices
- 8.33% Faculty Non-Cooperation
- 2.78% Poor Community Attitude
- 5.56% Mental Health
- 5.56% Inadequate Preparation
- 8.33% Family Pressures
- 2.78% Military Obligations

FIG. 18
deciding whether the poor administrative or the inadequate preparation factor was the primary cause of his leaving teaching.

Almost all of the factors would in some manner be affected by the mental health factor, making the choice of this factor by the graduate very difficult. When the mental health factor is discussed in Chapter V more supporting evidence will be given regarding the difficulty experienced by the graduate in choosing a decisive factor.

The Financial Factor Analysis

In Figure 19 a percentage analysis is given of the financial factor in order to show the particular reason why it was selected by the respondents as a significant factor in attrition. As indicated by the diagram, the single most significant reason for the selection of the financial factor as a prominent attrition factor was the item of "higher salary with more working hours."

The "other conditions" item significantly affects the large number of responses to the financial factor. This fact is indicated by the high percentage of responses, 35.58 percent (based on a total of 31 responses) to the "other conditions" item. Such reasons as faster advancement or promotion with salary, and a sufficient increase in salary to provide funds for more education, were included in the "other conditions." Several other reasons which were not financial
EFFECTIVENESS OF SALARY AND WORKING BENEFITS AS ITEMS CHECKED BY THE GRADUATE UNDER THE FINANCIAL ATTRITION FACTOR

12.83% MORE SALARY FEWER HOURS

19.35% HIGHER SALARY MORE HOURS

6.42% MARGINAL BENEFITS

35.58% OTHER CONDITIONS

25.82% NO RESPONSE

FIG. 19
in nature were also included by the respondents in this category. The high "no response" incidence under the financial factor might have been due to the inability of the respondent to make the choice of a decisive attrition factor.

**Extra Duty Assignments: Attrition Effect**

Figure 20 indicates a percentage comparison of the positive responses for this attrition factor. The extra duty assignments was the primary item indicated in this factor. Several respondents chose all items as important in their selection of this factor as the one which influenced them in leaving science teaching.

A few respondents selected more than one item under the poor administrative factor but did not include all the items under this factor. The result of these different types of responses made an analysis of the items under this factor difficult to present diagrammatically. For this reason, two categories were depicted in the diagram: one for those who indicated all items, and another category for those who indicated several items. Nevertheless, the two significant items under this factor emerge as the extra duty assignment item, and the inadequate laboratory time item. Such items as poor administrative disciplinary practices and the assignment to teach only students in a low intelligence quotient range were listed under the "other reasons" category.
THOSE WHO LEFT TEACHING PRIMARILY BECAUSE
OF POOR ADMINISTRATIVE PRACTICE

11.1% ALL REASONS

22.2% MULTIPLE REASONS

33.4% OTHER REASONS

22.2% IMPOSING
EXTRA DUTY
ASSIGNMENTS

11.1% INADEQUATE
TIME FOR LABORATORY

FIG. 20
<table>
<thead>
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<th>Figure</th>
<th>Description</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>25.</td>
<td>Percentage of Graduates Who Held the Highest Prestige Position in Their Community</td>
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<td>26.</td>
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<td>115</td>
</tr>
<tr>
<td>27.</td>
<td>Percentage of Graduates Who Did Graduate Work Since Receiving Their Bachelor's Degree</td>
<td>118</td>
</tr>
<tr>
<td>28.</td>
<td>The Kind of Graduate Work Taken of Those Who Did Graduate Work</td>
<td>122</td>
</tr>
</tbody>
</table>
The Remaining Attrition Factors

The remainder of the attrition factors include family pressure, community attitude, faculty cooperation, mental health, military obligation, excessive teaching load, and inadequate preparation. The data involving these factors are not presented in diagrammatic form primarily because the respondents did not select these factors as primary causes for their leaving science teaching. Some of the individual cases involving these factors are discussed in Chapter V. Since the present chapter deals with the clarification and interpretation of the data, only brief references will be made to the above listed factors.

Faculty Noncooperation as a Factor

The factor of faculty noncooperation was selected by three respondents. Noteworthy of these three cases was one in which all items were checked, indicating that the respondent thought this factor the most significant of all the attrition factors. This factor was also selected by two other graduates.

Family Pressure as a Factor

Family pressure was selected as an important factor of attrition by three respondents. Two of the three cases indicated that the husband was responsible for their
leaving science teaching. The latter two cases are referred to again in Chapter V. One case indicated that pregnancy was the reason for selecting the family pressure factor as a significant factor.

**Inadequate Preparation for Teaching as a Factor of Attrition**

The factor of inadequate preparation for teaching was selected by two respondents. One case indicated that he had a "feeling of a lack of depth of preparation," which he felt resulted from his moving from one state system to another, because each state required different standards of teaching competency. The other case did not explain his reason for checking this factor.

**Mental Health as a Factor**

Mental health was selected as a contributing attrition factor to science teaching by two respondents. One graduate indicated this factor as significant but did not explain the reason for the selection. The latter respondent also indicated that the reason for leaving science teaching was due to his assignment to teach students of low intelligence quotient range. Perhaps the latter statement indicates the reason that this graduate did not explain his selection of the factors of inadequate
preparation and mental health as factors of attrition. The data involving the latter case are discussed in Chapter V.

**Community Attitude and Military Obligation as Factors**

Since only one respondent selected each of the factors of community attitude and military obligation as significant attrition factors, a discussion of the interpretation of the data for these factors was omitted.

**Group D: Quality of the Position Obtained**

"Top Salaried Position" Attainment for the Group Which Remained and the Group Which Left Teaching

Figure 21 indicates the percentage of all respondents who obtained the "top salaried position" in their communities. The "top salaried position" was the position which paid the top salary of all the science-teaching positions in the community. These data were sought to help ascertain the quality of the position held by the graduate. The diagram indicates that two-thirds of all the respondents who taught (60) never held the "top salaried position." If the "no response" correction is made, the figure representing those who never held the "top salaried position" changes from 66.67 per cent, as indicated in the figure, to 78.89 per cent. Although the percentage of "no responses" is rather high (18.33 per cent), the
percentage figure before making the correction clearly
indicates that more of the group of graduates who taught
never held the "top salaried position" in science than those
who held the position. The assumption may be made that some
of those who never held the "top salaried position" had the
opportunity but refused to secure the position. This
assumption will be verified by data which will be
interpreted later in this chapter.

Of the group of graduates who left teaching, 65.52 per
cent indicated that they never held the "top salaried" sci­
ence teaching position. Of the group which remained in
teaching, 64.51 per cent responded in a like manner. If the
"no response correction method" is applied, the percentage
figures change to 75.86 per cent for the group which left
teaching and 80.64 per cent for the group which remained in
teaching. Further discussion of these data is given in
Chapter V.

"Top Salaried Position" Attain­
ment: The Effect Upon Position
Availability

Figure 22 presents another aspect of the data concerning
the "top salaried" teaching position. The diagram indicates
the percentage ratios of teaching positions available to the
graduate in the communities where the graduates taught. As
the diagram indicates, 34.94 per cent of the available posi­
tions were in high schools and 33.74 per cent of them were
in junior high schools. The percentages were based on the
PERCENTAGE OF GRADUATES WHO HELD TOP SALARIED SCIENCE POSITIONS IN THEIR COMMUNITY

FIG. 21
POSITIONS IN JUNIOR AND SENIOR HIGH SCHOOL
SCIENCE EXISTING IN COMMUNITIES WHERE
GRADUATES TAUGHT REPRESENTED AS
PERCENTAGE OF TOTAL RESPONSES

34.94% SENIOR HIGH POSITIONS

33.74% JUNIOR HIGH POSITIONS

NOT REPORTED 31.32%

FIG. 22
responses for the junior and senior high levels compared to the total possible responses to the different categories. Approximately 98% of the graduates were prepared to teach junior and senior high school science and only two of the total one hundred-nine were prepared to teach elementary science. One and eighty-three hundredths per cent were prepared to teach at three levels. Two graduates of the 109 included in this study obtained dual certificates, but they did not respond to the questionnaire.

From the two percentage figures which show the positions available, it is logical to assume that the "top salaried" science teaching opportunities would be somewhat limited to many of the graduates. This statement is based upon the fact that many of the existing positions in the communities where the graduates taught were in elementary school systems, and it is assumed that the large number of cases in the "not indicated" category probably were due to the science positions available in the elementary system.

In order to show the effect of the limited position opportunities upon the graduate's ability to obtain the "highest quality" teaching position, the number of available high-school and junior-high-school positions have been presented in tabular form. Table 3 indicates that the median number of positions reported in both the junior and the senior high schools by the respondents was four to nine positions for each community. The actual number of
**TABLE 3**

NUMBER OF POSITIONS REPORTED AS EXISTING IN COMMUNITIES WHERE GRADUATES TAUGHT

<table>
<thead>
<tr>
<th></th>
<th>Senior High Those Reporting</th>
<th>Junior High Those Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 25 positions</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10-25 positions</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4-9 positions</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>3 positions</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>2 positions</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>1 position</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>0 positions</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Not reported</td>
<td>13</td>
<td>13</td>
</tr>
</tbody>
</table>

Median number of positions reported: 4-9 4-9
respondents is listed in the table with respect to the number of senior- and junior-high-school positions reported to exist in their communities. As indicated in the table, two respondents indicated as many as twenty-five senior-high-school positions in science existed in the communities where they taught. Three respondents indicated more than twenty-five junior-high-school science positions existed in the communities where they taught. These data show further evidence of the limited science-teaching positions available to the respondents.

"Top Salaried Position"

Specific information was sought from the graduates regarding their opportunities in securing the "top salaried" science positions in their communities. These data were obtained to determine the significance which holding the "top salaried position" might have in relation to the persistence of the graduate in remaining in teaching. Seventy per cent of the respondents of the group who taught (60 graduates) indicated that they had never been offered a "top salaried" science teaching position.

Of the group who taught, 6.66 per cent (4 cases) indicated that they had been offered the top salaried position in their communities, and each of those who responded in the affirmative indicated that they had refused the
position. The reasons for refusal were a decision to do further graduate work, a desire to do work with youngsters at a lower age level, a dislike for the administration, and responsibilities incompatible with the salary offered. The implication of these replies will be discussed in greater detail in Chapter V. The data indicated that three of the four cases described were from the group which remained in teaching.

Teaching Salary Compared with Community Occupations

Figure 23 shows that the majority of the science-teaching positions held by the respondents who remained in teaching were comparable in salary to the skilled labor occupations in the community. As indicated in Figure 24, the skilled labor occupational category was the most frequent choice as an occupation which showed a salary comparable to that of the teaching positions for the group which left teaching.

It may be noted that the percentage differential between the occupational categories for the group which left teaching was considerably smaller than the differential found among the occupational categories for the group which remained in teaching. However, this fact might be explained by examining the "no response" category for each group. The "no response" figure was quite a bit higher for
CHAPTER I
BACKGROUND AND ORGANIZATION OF THE STUDY

Introduction

For more than a century a variety of types of institutions have prepared teachers of science for our secondary schools. Liberal arts colleges, teachers colleges, normal schools, and universities have shared in supplying these important instruments in our system of education.\(^1\)

The various programs that exist today for the preparation of science teachers did not originate as specific preparatory curriculums but rather as deviations from general curriculums which had their origin deeply rooted in the classical concept of education. A slow and deliberate change took place from a rigid but general curriculum based on the languages and arts to a flexible curriculum specifically designed for teachers of science. The classical program in the colleges and in the early secondary schools, called Latin Grammar Schools, which operated from 1650 to 1750, embodied virtually no science except that

SALARY OF TEACHING POSITIONS HELD BY THOSE GRADUATES WHO REMAINED IN TEACHING COMPARED TO OTHER OCCUPATIONS

- **No Responses**: 29.03%
- **Skilled Labor**: 38.71%
- **Small Business Ownership**: 16.13%
- **Professions**: 9.68%
- **Common Labor**: 6.45%

**Fig. 23**
SALARY OF TEACHING POSITIONS HELD BY THOSE GRADUATES WHO LEFT TEACHING COMPARED TO OTHER OCCUPATIONS

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Responses</td>
<td>41.38%</td>
</tr>
<tr>
<td>Skilled Labor</td>
<td>27.58%</td>
</tr>
<tr>
<td>Small Business</td>
<td>17.24%</td>
</tr>
<tr>
<td>Ownership</td>
<td></td>
</tr>
<tr>
<td>Common Labor</td>
<td>13.80%</td>
</tr>
<tr>
<td>Professions</td>
<td>0.009%</td>
</tr>
</tbody>
</table>

Fig. 24
the group which left teaching than for the group which remained in teaching. If the "no response" correction is made for the percentage figures for the skilled labor categories in Figures 23 and 24 (38.71 per cent for the group which remained and 27.58 per cent for the group which left teaching), the figures in the skilled labor categories are changed to 48.38 per cent for the group which remained in teaching and 51.72 per cent for the group which left teaching. As is apparent from these figures, the group which left teaching now shows a larger percentage figure for the skilled labor category than the group which remained in teaching. Since the data trend was reversed after the correction for the "no responses" was made, implications for these data are not stated.

Attainment of a "Prestige Position" for the Group Which Remained and the Group Which Left Teaching

Figure 25 indicates a percentage comparison between the two groups, those graduates who left teaching and those graduates who remained in teaching, with regard to the attainment of the "highest prestige science teaching position" in the community where the graduates taught. The 

The "highest prestige position" refers to the science-teaching position which carried the greatest prestige in terms of responsibility, salary, and desirable working conditions of all the existing science-teaching positions in the community.
diagram shows, on the one hand, that of the group which remained in teaching, which represents 50.17 per cent of the respondents from the group which taught, 61.29 per cent never held the "highest prestige position"; and on the other hand, 65.17 per cent of the group which left teaching, which comprises 49.83 per cent of the respondents from the group who taught, never held the position which carried the highest prestige in the community. It is important to note that the percentage of "no responses" for the group which left teaching is considerably higher than the percentage figures in the "no response" category of the group which remained in teaching. If the "no response" correction is applied, the figures given in the diagram are changed to 89.65 per cent for the group which left teaching and 74.19 per cent for the group which remained in teaching. It might be assumed that the noticeable difference between the latter two percentages would indicate an important relationship which the effect that prestige in position may have upon the persistence of the graduate in remaining in teaching. This relationship will be discussed in Chapter V.

The Prestige Carried by the Teaching Position: A Comparison with Other Community Occupations

Specific information was sought regarding the prestige of the science-teaching position which was held by the
graduate. Several of the major occupations common to the average American community were chosen as a "yardstick" for calculating the prestige carried by the teaching position held by the graduate. Figure 26 shows that the greater percentage of graduates indicated that the position they held corresponded closely with the prestige carried in the community occupations of the small business owner and the civil-service employee. The group which left teaching indicated that a close comparison existed between the prestige carried by the occupation of the bank employee and that of the teaching position they held. The latter group also indicated that the occupation of nursing compared second in prestige with their teaching position. The reason for the marked discrepancy in the difference in selection of the occupations for comparison of prestige between the graduates in the group which left teaching and the graduates from the group which remained in teaching cannot be explained from the data. It is probable that more of the graduates who remained in teaching than the graduates who left teaching taught for a longer period of time in a community. Assuming the latter statement to be true, it is possible that a more valid judgment of the prestige of occupations could be made by those from the group which remained in teaching than from the group which left teaching. Since this explanation is conjectural, its
PERCENTAGE OF GRADUATES WHO HELD THE HIGHEST PRESTIGE POSITION IN THEIR COMMUNITY

- 61.29% never held highest prestige positions
- 16.13% held highest prestige positions
- 22.58% no response
- 65.17% never held highest prestige positions
- 6.83% held highest prestige positions

- 50.17% graduates still teaching
- 49.83% graduates who left teaching

FIG. 25
A COMPARISON OF THE PRESTIGE OF THE GRADUATE'S TEACHING POSITION WITH THE PRESTIGE CARRIED BY THE MAJOR OCCUPATIONS OF THE COMMUNITY

<table>
<thead>
<tr>
<th>Those Who Remain-</th>
<th>Occupations</th>
<th>Those Who Left Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>ed in Teaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00 %</td>
<td>Bank Director</td>
<td>0.00 %</td>
</tr>
<tr>
<td>6.45 %</td>
<td>Bank Teller</td>
<td>17.25 %</td>
</tr>
<tr>
<td>12.90 %</td>
<td>Civil Service Employee</td>
<td>10.34 %</td>
</tr>
<tr>
<td>9.68 %</td>
<td>College Professor</td>
<td>3.45 %</td>
</tr>
<tr>
<td>6.45 %</td>
<td>Engineer</td>
<td>0.00 %</td>
</tr>
<tr>
<td>9.68 %</td>
<td>Minister</td>
<td>10.34 %</td>
</tr>
<tr>
<td>9.68 %</td>
<td>Nurse</td>
<td>10.34 %</td>
</tr>
<tr>
<td>0.00 %</td>
<td>Physician</td>
<td>0.00 %</td>
</tr>
<tr>
<td>12.90 %</td>
<td>Small Business Owner</td>
<td>17.25 %</td>
</tr>
<tr>
<td>32.26 %</td>
<td>No Response</td>
<td>31.03 %</td>
</tr>
</tbody>
</table>

Fig. 26
importance as a valid explanation for the discrepancy described above is minimized. Due to the discrepancies in the interpretation of the data discussed above, implications were not made for these data.

Group E: Graduate Work

How the Data Were Used

The data pertaining to graduate work were sought for the purpose of evaluating the professional improvement which the graduate had made since receiving his Bachelor's degree. Quantitative aspects of the data have been expressed only through the use of general terms of comparison. For example, the hours-of-credit quantities are expressed in terms of "more or less" or "greater or smaller" relationships. One reason for not using specific quantitative relationships in a specific number of hours is because of the lack of information often given by the respondent. This lack of information is due to the graduate's not having an official transcript or record from which the information might have been obtained. Any specific quantitative data which were needed regarding this phase of the study were taken from the graduate's transcript. These permanent records data have been dealt with in Chapter III.
Work Taken in Science or Related Subject Areas

Figure 27 indicates the percentages of the graduates in the two groups, those who remained in teaching and those who left teaching, who did graduate work in science or in related subject areas. The observation may be made from the diagram that a large percentage in each group did graduate work. It is also apparent from the diagram that a far greater number of the graduates who did not do graduate work, belonged to the group which left teaching. The implications of these data as a basis for an evaluation of the status of the science-education graduate are discussed in Chapter V.

Although not apparent from the information depicted in Figure 27, the least number of graduate hours taken by those who took graduate work was 6 hours and the greatest number taken was 159. These data were taken from the questionnaire results.

Credit Hours Taken by the Group Which Remained and the Group Which Left Teaching

Table 4 indicates that most of the respondents from the group which taught (60 cases) took between 30 and 40 quarter hours in science and science-related courses at the graduate level. An explanation is provided for the discrepancy between the number of cases involved in these
Percentage of Graduates Who Did Graduate Work Since Receiving Their Bachelor's Degree

87.10% DID GRADUATE WORK

6.45% NO RESPONSE

6.45% NO GRADUATE WORK

62.07% DID GRADUATE WORK

31.03% NO GRADUATE WORK

6.90% NO RESPONSE

Fig. 27
offered incidentally with a body of content which emphasized philosophy. This program, originally sterile in science, evolved into a curriculum which emphasized the practical application of science.

The radical change in the preparatory programs for science teachers was affected markedly by the writings of Herbert Spencer and Thomas Huxley who made a plea for a toleration of science in the curriculum. Prominent committees, such as the Committee of Ten and the Committee on Reorganization of Secondary Education, which functioned in the later 1800's and early 1900's also produced changes. In its recommendations for a better science curriculum, the Committee of Ten considered such problems now current as those of adequately prepared teachers and improved laboratory instruction. Although the latter committee dealt primarily with the secondary-school curriculum, the change effected in the secondary curriculum quickly made the demand upon the colleges and universities to produce better prepared teachers for the new programs in the secondary schools.

The shift of emphasis in the secondary-school science curriculum toward a particular social aspect of science, or the social utility concept of science, grew out of a report

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2Ibid., p. 1734. 3Ibid., pp. 1112-16. 4Ibid., p. 1217.
data (Table 4) and the actual number of graduates which comprised the group which taught. The figures in Table 4 represent the number of graduates in each group minus the "no responses" in that group. Thus, for the group which left teaching 18 cases responded, 9 took no work beyond the Bachelor's degree, and 2 failed to respond to this portion of the data inquiry.

It is interesting that of the 5 cases from both groups who took over 100 hours, 2 graduates had taken above 120 hours, and 1 graduate had taken 159 quarter hours. The last three teachers were working toward a Ph.D. degree but none of the three had received a graduate degree at the time the questionnaire was sent. One graduate had left science teaching to pursue graduate work on a full-time basis. The other two had taken graduate work while teaching and during each summer since graduating at the Bachelor's level. All three graduates had taken graduate work in one of the pure science fields.

**Subjects Taken as Graduate Study**

Figure 28 indicates the distribution of cases (49) from the total number of respondents among the area of professional preparation, science, and related science subject-matter areas. Most of the graduates took courses in the area of professional preparation. The data indicated that the percentage of graduates who took courses in this area
<table>
<thead>
<tr>
<th>Those Who Remained in Teaching</th>
<th>No. of Quarter Hours Taken</th>
<th>Those Who Left Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3-10</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>10-20</td>
<td>2</td>
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<tr>
<td>2</td>
<td>20-30</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>30-40</td>
<td>5</td>
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<td>40-50</td>
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<td>3</td>
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<td>1</td>
<td>90-100</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Over 100</td>
<td>1</td>
</tr>
</tbody>
</table>
amounted to more than the combined percentages of those who took courses in the six subject-matter areas. The data indicate that the "no response" category represented a considerable percentage of the entire number of graduates who responded to this portion of the questionnaire. If the "no responses" had answered in the same pattern as the responses, the percentages change. The percentages for the group which remained in teaching, represented in the bottom left diagram of Figure 28, would show 62.07 per cent took professional methods courses and 27.59 per cent took biology. For the group which left teaching who took graduate work (20 graduates) the changes would show that 65 per cent took professional methods courses, 7 per cent took biology, 7 per cent took physics, and 7 per cent took chemistry. Thus a greater percentage of those who left teaching took professional methods courses than of those who remained in teaching. The changes in percentage relationships which would occur if the no responses had been answered in the same pattern as the responses, would indicate the group which left teaching would have taken as much work in professional methods courses as the group which remained in teaching. Because of this apparent change in data direction as a result of considering the no responses, any conclusion will be drawn only on the data from the positive responses.
THE KIND OF GRADUATE WORK TAKEN
OF THOSE WHO DID GRADUATE WORK

40.82 %
Those who left

59.18 %
Those who remained

THOSE WHO DID GRADUATE WORK

48.27 %
Professional Methods Courses

27.59 %
No Responses

20.69 %
Biology

3.45 %
Math

THOSE WHO REMAINED

45 %
Professional Methods Courses

5 %
Biology

5 %
Chemistry

5 %
Physics

40 %
No Responses

THOSE WHO LEFT

FIG. 28
Reasons for Not Taking Graduate Work

Specific information was obtained concerning the reasons why the graduate had not taken graduate work. The number of those who indicated that no graduate work had been taken was relatively small, only ten cases. Several of these cases, important from the standpoint of their relationship to the general problem of attrition among science teachers, will be dealt with individually. The graduate was furnished with several reasons from which he could choose the one which best applied to his situation. These reasons were selected from those that are frequently given by college graduates for not taking graduate work. The choices of reasons were as follows: no incentive, change of occupation, financial problems, change of teaching field, distance too great from an institution offering graduate work, illness, military obligation, and other experience more valuable. The opportunity was also afforded the graduate to list other reasons not specified by the questionnaire.

Of the ten cases, one graduate indicated financial problems, one illness, and two indicated family responsibilities under the "other reasons" category. The latter two cases involved female graduates who listed pregnancy and child care as the basic reasons for not having taken graduate work. One graduate indicated that he had gone
into military service and had been stationed at a military post located too far from an institution where he could take graduate work. One graduate who considered other experience more valuable than graduate work indicated that he had worked in industry each summer. Of the ten graduates who indicated no graduate work had been taken, only two remained in teaching. Concerning the latter two cases, a change of occupation and a military service obligation were indicated as reasons for not having taken graduate work.

Summary

The data used for this chapter were collected by means of a questionnaire. This instrument was sent originally to the 76 teachers who entered the Science Education Program during the period 1949-1952 at The Ohio State University.

Several important professional problem areas, discovered through the investigation of the student's postgraduate status, have been identified and clarified. The problem areas include the success of the science-education student in obtaining a teaching position, the persistence with which the student held the position he obtained, the success of the student in obtaining a position of prestige in the community, the success of the student in obtaining a top-salaried science position, the high attrition rate among science teachers and the
contributing factors, and the extent to which the student improved himself professionally by taking graduate work.

Data were collected concerning the problem areas listed above for the purpose of clarifying these areas. The data were divided into specific categories, such as general background, including family history, marital status, community environment, and racial background; occupational history, including type of school in which the student taught, occupational stability, employment outside his teaching field and the type of position obtained; reasons for leaving science teaching, including the contributing factors data; the quality of position obtained, including factors of prestige and economics; and the amount of graduate work done, including the type of courses taken and the credit hours received.

The conclusions drawn concerning the data in this chapter are discussed in Chapter V.
CHAPTER V
THE IMPLICATIONS OF THE RELATIONSHIPS IN THE
EVALUATION OF THE SCIENCE EDUCATION
STUDENT'S POSTGRADUATE STATUS

Introduction

The purpose of this chapter is to identify several of the problems of the postgraduate status of the science education student. The questionnaire was used for obtaining the data used in the status analysis.¹

Of particular importance in this study are the data which have implications for the following status-problem areas: the occupational stability of the science education student; the persistence on the part of the student in remaining in science teaching; the quality of the position obtained by the student; the length of time the student spent in teaching; the reasons why the student left teaching; and, certain problems involving individual cases which showed deviations from the normal pattern in the problems discovered in the status analysis of the science education student.

¹See Questionnaire, Appendix, p. 179.
The point must be emphasized that not all of the data presented in either Chapter III or Chapter IV were used in this chapter. Some of the data were omitted because the implications of these data for the areas mentioned above were not of critical importance to the objectives of the study.

**Organisation and Treatment of Data**

The status evaluation areas will involve two sources of data: (1) the implications of the data obtained from the student’s permanent record and (2) the implications of the data obtained from the questionnaire.

**Data from the Student’s Permanent Record**

**Sex Distribution of Those Who Began Teaching: Implications**

From the compilation of the student cases from the permanent records the fact was discovered that a greater percentage of men than women actually began teaching after graduation.° The number of women teachers in all areas of science is far less than the number of men teachers and is decreasing at a fast rate. A percentage comparison shows that only 27% of the total teachers in science are women.³

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The fact that science has always been taught predominantly by men would account for the great difference in percentage proportions in favor of the men. However, the ratio between those prepared to teach and those who actually remain in teaching is decreasing for women and increasing for men. The hypothesis may be advanced that more men than women began teaching science after graduating, but the dropout among men teachers was greater. Contrariwise, the attrition among teachers due to factors of marriage, family responsibility, and illness is higher for women than men. The data in this study seems to support the latter statement based on the results reported by Fletcher Watson et al.

Effect of a High Enrollment Upon Job Availability

The fact that the three-year enrollment used for this study represented "peak" enrollment years indicates the reason why this period was chosen in this research design. The effect which this abnormally large enrollment would have upon the problem of the attrition rate among the science-education graduates at The Ohio State University is somewhat difficult to predict, but nevertheless important. It is obvious that this enlarged enrollment would result in a greater number of students competing for

4Ibid., p. 15, Table 3.
by the Committee on Reorganization of Secondary Education submitted in 1918.\(^5\) Yearbooks and reports of national committees also had a great effect upon the changing structure in the programs for the preparation of science teachers. One of these yearbooks, *The Thirty-first Yearbook*, Part I, of the National Society for the Study of Education titled *A Program for Teaching Science* which appeared in 1932, emphasized scientific generalizations.\(^6\) This emphasis markedly affected the content of the syllabuses and books which were used in science at the secondary level. In 1938, The Committee on the Function of Science in General Education of the Progressive Education Association presented its report, *Science in General Education*, which stressed the need for instructional emphasis upon interaction between science and the social situation. This report also emphasized the importance of structuring the high school curriculum around The Ten Imperative Needs of Youth.\(^7\) This new concept in curriculum involved a "core approach" which utilized large blocks of time in which the

\(^5\)Ibid., pp. 1112-16.


teaching positions, but it is less obvious that the increased enrollment created a larger number of failures to find teaching positions. It is important that the creation of a keener competition for teaching positions forced the less qualified prospective science teachers to accept positions which were less desirable from the standpoint of salary and prestige carried by the positions. Thus, many graduates who began teaching left because they obtained undesirable positions at the beginning of their career. The large enrollment thus indirectly caused a greater attrition rate through the creation of a greater competitive market for science-teaching positions.5

Students Who Made One Transfer: Implications for Occupational Stability

The investigation of the transfer status of the students who began teaching indicated that about the same percentage of students who transferred from one college to another, at least once prior to entering teaching, remained in teaching, as did those students who transferred and left teaching.6 These results seem to suggest that a lack of complete stability during the undergraduate preparation of the science-education student has little or

5See Chapter III, pp. 28, 29.
6Ibid., p. 33.
no relationship to occupational stability in his teaching. These results may be contrary to what is expected with regard to the prediction of a stability in teaching based upon transfer during the undergraduate preparation for the graduates who remain in teaching. The failure to make a prediction on this basis may be explained simply as the operation of a "satisfaction-seeking factor" on the part of the graduate. In other words, transfer from one college program to another prior to graduation may have meant an attempt by the student to obtain a self-satisfying preparation for an occupation. When the desired field of preparation, either science education or another field, is finally found, the student is content to stay in that field of preparation. It may be assumed that the student who finds satisfaction in his field of preparation will show a higher degree of stability by remaining in that field than the student who is dissatisfied with his field of preparation.

Students Who Made Two or More Transfers: Implications for Occupational Stability

The implications of the data concerning students who transferred once seems to suggest that occupational instability cannot be predicted on the basis of transfers during the student's undergraduate preparation. However, there does seem to be some relationship between the
student's record which shows numerous transfers and a prediction of occupational instability. Support for the latter statement is found in the fact that the group who left teaching indicated a far greater percentage of graduates in the "twice transfer category" than was indicated for the group who remained in teaching. It would appear that the seven graduates from the group remaining in teaching and the nine graduates from the group leaving teaching represented a small number to use as evidence to verify an assumption. However, it would seem logical to suggest that there was a relationship between the student's record which showed two or more transfers in the undergraduate program and an instability in his teaching occupation. Support for this statement was indicated by the fact that nearly all of the students who subsequently left teaching had a record which indicated numerous transfers during their undergraduate preparation.

Point-Hour Ratio: Relationship to Persistence in Remaining in Teaching

The data comparing the point-hour ratios of the group which remained in teaching with the group which left teaching indicated that the group which left teaching had

7Ibid., pp. 33, 34, 35.
slightly higher academic averages. This would seem to suggest that there is little or no relationship between a good academic record and a persistence on the part of the student in remaining in teaching. Although what is revealed by these data is not surprising, an adequate explanation for the revelation is rather difficult. However, a conjectural explanation might be offered. Those with backgrounds of academic success might have the security and self-confidence to seek different occupations, whereas those with less security resulting from poor academic records of achievement might remain in teaching because they are apprehensive concerning other occupations.

Areas of Preparation: Implications for a Relationship to Occupational Stability

From the implications of the data in Table 1, the hypothesis may be advanced that those graduates with a background in physical science might have been influenced to a greater degree to leave teaching to go into industry than students with a biological science background. However, the data indicate to the contrary. No evidence was found to indicate that a particular subject area

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8 Ibid., p. 39.
9 Ibid., pp. 40, 42.
background could be identified with the student's persistence in remaining in teaching. In other words, the data indicated that the area of preparation was not an influencing factor in causing the attrition rate to rise among science teachers included in this study.

These data also may suggest the hypothesis that the physical-science minded society in which the graduates lived had little influence upon their persistence in remaining in teaching. Other data indicate that the influencing factor for leaving science teaching is financial rather than academic background.

Hours Taken by the Graduate in the Professional Area Related to Occupational Stability

The assumption would seem logical that the student who had more experience in the professional teaching area would have a greater tendency to stay in science teaching. As the data indicated, this was not the case.

These data would suggest that although the professional courses may prepare the student to teach, the effect of the courses does not create an incentive or desire to remain a science teacher.

10 Ibid., p. 42.
11 See Chapter IV, p. 91.
12 See Chapter III, pp. 42, 44, 45.
Deficiencies in Professional Courses: Implications for a Persistence in Remaining in Teaching

The data concerned with a deficiency in credit hours in professional work and its relationship to a persistence in remaining in teaching involved only two cases. Although these two cases represent a number too small upon which to base an assumption that a relationship might exist between the two factors, the apparent relationship supported by the evidence found in these two cases is, nevertheless, provocative. To emphasize the importance of the latter statement, one has only to consider the one of the two cases described above which remained in teaching even though a deficiency in professional work was indicated. This fact indicates that, in this instance, a deficiency in professional work did not prevent the graduate from proceeding with teaching as a career.\(^{13}\)

Academic Success: Its Implications for Occupational Stability

The data comparing the group which remained in teaching and the group which left teaching with regard to academic success revealed no surprising results. Studies have been made which indicated that high grades have very little relationship either to the selection of teaching as

\(^{13}\)Ibid., pp. 51, 52.
a career or to a persistence in remaining in teaching.\textsuperscript{14} The data in Chapter III supported the findings of these studies by indicating that there was no relationship of academic success to the persistence with which the student remains in teaching.\textsuperscript{15} However, the inference might be logically drawn that the failure to obtain data which would indicate a means for predicting occupational success is due to many other significant variables which also play a part in the attrition rate increase among science teachers. The reference here is to the variables which include the factors of family pressure, economics, and working conditions.

\textbf{O.S.P.E. Scores: Implications for a Persistence in Remaining a Teacher}

A comparison of the group which remained in teaching with the group which left teaching, on the basis of their O.S.P.E. scores indicated that no appreciable difference was found between the two groups with respect to the number of graduates found in the low and high O.S.P.E. score categories.\textsuperscript{16} Since this examination is basically an intelligence examination, these data could be interpreted to

\textsuperscript{14}See the Study by Heald, Chapter II, p. 17.

\textsuperscript{15}See Chapter III, pp. 45, 46.

\textsuperscript{16}\textit{Ibid.}, p. 48.
mean that this particular examination may not be successfully used as a predictor of the student's career choice. An explanation for the failure of the examination when used as a predictor of career preference is provided. The student may either not be aware of the meaning of the examination or he may not have a knowledge of his score. The possibility also exists that the student may also not be cognizant of one other important factor, that a failure in remaining in teaching may be due to reasons of an innate nature. In other words, reasons which might be justifiably used as predictors of career success often cannot be used because of other factors operating against their effectiveness.

The data in Chapter III indicated that those who failed in their career by leaving teaching did not show scores in the lower percentile.\(^1^7\) In other words, low O.S.P.E. scores were not used as an indicator of the prediction of career success because the data indicated that as many of those who remained in teaching as those who left teaching received low scores.

\(^{17}\)Ibid.
Student Teaching in the Minor Area: Implications for a Persistence in Remaining a Teacher

Certain data indicated that the number of students who did student teaching in a minor area was approximately the same for the group which remained in teaching as for the group which left teaching. These data would seem to indicate that the insecurity which may be expected to manifest itself in the student's career from a lack of student teaching experience in an area in which the graduate taught could not be considered a factor which would influence him to leave teaching. As a matter of fact, the number of students (twelve) who did student teaching in a minor area, did not suggest this reason as one which contributed to their leaving teaching.

Implications of the Data from the Questionnaire

Family Responsibilities: Implications for the Attrition Rate Factor

The data from Chapter IV indicated that over 75 per cent of the respondents were married and over 50 per cent had from one to three children. The data also indicated that a greater percentage of those graduates who remained

18 Ibid., p. 51.

19 Ibid.
in teaching than those who left teaching had from one to three children. This situation may have been due to the fact that most of those who left teaching left during the first two years. A short period of tenure for those who left teaching compared with a much longer period for those who remained in teaching, probably explains the reason for the larger families among the group which remained in teaching. The latter statement may suggest that those who remained in teaching had greater family responsibilities than those who left teaching. Assuming the latter statement is true, the hypothesis may be advanced that greater family responsibility was not a factor which caused the graduate to leave teaching.

**History of Teachers in the Family: Implications for Persistence in Remaining a Teacher**

The data dealing with the history of teachers in the family of the graduate indicated that a greater percentage of those graduates who remained in teaching than those who left teaching had a history of teachers in the family. On the one hand, these data may suggest that teachers in the family are an influencing factor upon the science teacher in remaining in teaching. On the other hand,

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20 Chapter IV, pp. 75, 76.

21 Ibid., p. 59.
students sought to solve problems based upon their needs. This new approach in education demanded that the preparatory institutions produce teachers who could teach in the core curriculum.8

The report of the Harvard Committee, General Education in a Free Society, stressed the inclusion of science in the curriculum as an important objective in general education.9 This report proposed the belief that science instruction in general education should be characterized by broad areas of living in which a comparison was made between scientific thought and other modes of thought in daily living. This report's appearance in 1945 caused the institutions responsible for the preparation of science teachers to consider general education as an innovation in education, one demanding a special preparation of science teachers.10

The Forty-sixth Yearbook, Part I, of the National Society for the Study of Education made recommendations for improving science instruction in the secondary school and, in addition, emphasized the need for more science

8Ibid., pp. 64-253.
10Ibid., pp. 195-201.
other data indicated that family pressure from nonteaching members in the family is an attrition factor. In the cases where the latter factor operated, the influence was in most instances exerted by the husband upon the wife as a science teacher. Further support is provided for the implication that teachers in the family influence the graduate's persistence in remaining in teaching. The data supporting the implication indicated that a greater percentage of active teachers in the family were found in the group which remained in teaching than in the group which left teaching.

Teaching Level and Subject Area of Teachers in the Family: Implications for a Career Choice by the Graduate

The data from Chapter IV indicated that a greater percentage of the teachers in the family taught at the secondary level than at the elementary level. Since virtually all of the graduates included in this study taught at the secondary level, this may suggest that the level of teaching of the members of the family could have some effect upon the level of teaching chosen by the science education graduate.

22 Ibid., pp. 99, 100.
23 Ibid., p. 60. 24 See Figure 5a, p. 62.
Data involving the area of teaching of the teachers in the family of the graduate indicated that a slightly higher percentage of the family members taught in the humanities and mathematics areas than in the science, physical education, and commercial subjects areas. However, the teachers in the family showed a relatively equal distribution among all areas. These data would indicate that teaching in a certain area by teachers in the family of the graduate had relatively no influence upon the graduate's choice of teaching area.

Community Environment: Size and Its Effect upon the Quality of Position Obtained

The data indicated that the majority of the graduates resided in large urban communities prior to entering college. The hypothesis may be advanced that the environment of the graduate prior to entering college would have an effect upon the choice in locations of a position obtained by the graduate. In other words, those graduates who came from urban communities would seek jobs in urban communities, while those who came from rural communities would seek positions in rural communities. However, the data indicated that a greater percentage of the graduates who came from the rural communities taught in rural schools than taught in

\[25\text{See Figure 5b, p. 62.}\]
urban schools. This fact would seem to suggest that there was not evidence indicating a movement of teachers toward the urban type of position rather than the rural type of position.

Community Economic Setting: Implications for Attaining Positions of "High Quality"

The data from Chapter IV indicated that the industrial community was the characteristic type of economic environment in which the graduate resided prior to attending college. The data indicated that a greater number of the graduate group from the urban environment obtained more of the "high quality" positions in the urban community than the group from the rural and semi-rural environments. The "high quality" positions refer to the urban positions rather than the rural positions. The urban positions are generally considered to be positions of higher quality than are rural positions with regard to salary, prestige, and responsibility. This fact suggests that those graduates who came from the urban communities were more successful in obtaining the better positions than those graduates from the rural communities. This implication is further supported by the data which indicated that a greater percentage of those graduates who came from the urban environment
obtained the better quality urban positions than were obtained by the graduates from the rural environments.\textsuperscript{26}

\textbf{Ethnic Groups as Backgrounds: Implications for Quality of Position Attainment}

As indicated by the data from Chapter IV, a greater percentage of those who attained the better science teaching positions with regard to salary, prestige, and responsibility carried by the position came from a heterogeneous environment of multi-ethnic groups.\textsuperscript{27} The environments were characterized by certain ethnic groups which were discriminated on the basis of race, customs, and traits. The implication from these data may be obvious but it needs some supporting evidence to emphasize its importance. On the one hand, the fact is evident that a graduate who came from a heterogeneous environment no doubt lived in a world of keener competition where his acceptance as part of his environment was constantly questioned. On the other hand, the graduates from the one-culture homogeneous-type environment probably lived in an environment where their acceptance was much less of a problem. This statement may suggest that the student from the more competitive type of culture would naturally strive for the

\textsuperscript{26}See Chapter IV, p. 66.

\textsuperscript{27}Ibid., p. 70
continuous improvement of his situation and feel the greater need to compete and succeed than the student with a lack of sensitivity for this need. Thus, the reason becomes understandable why the student from the heterogeneous competitive type background would succeed more often in obtaining the better positions than the student from the homogeneous environment of less competition.

The Organizational Pattern of the School System: Implications for Persistence in Remaining in Teaching

Data were obtained concerning the effect of teaching in a particular pattern of school organization upon the graduates' persistence in remaining in teaching. The data indicated that about 40 per cent of those graduates who left teaching taught in the "6-3-3 plan." There was no evidence to suggest that teaching in a system which employed this plan could be a causative factor of attrition. The reason for making the latter statement is that 60 per cent of the graduates taught in organizational plans other than the "6-3-3 plan." These graduates exhibited as great persistence in remaining in teaching as those who taught in the "6-3-3 plan." Another reason for considering that teaching in a particular plan had no effect as an attrition factor is that about the same percentage of those who remained in teaching as those who left also taught
under the "6-3-3 plan." The data indicated that the "6-3-3 plan" was one of the two predominant plans of five plans indicated by the graduates as patterns of school organization in which they taught.

Position Changes While Teaching: Implications for the Teacher Attrition Problem

The data concerning teaching position changes and the effects of these changes as an attrition factor indicated that approximately 28 per cent of those graduates who left teaching left within one year or less. 28 Furthermore, 50 per cent of all those who taught, including those who left as well as those who remained in teaching, had changed positions at least once at the time the questionnaire was sent. 29 The hypothesis may be advanced that the student who changed positions frequently would probably not remain in teaching. Support for this hypothesis can be found in the fact that data from the questionnaire indicated that a greater number of those who remained in teaching than those who left teaching fell into the "no position changes" category. The data concerning the relationship between job stability and its effects as a causative factor of attrition indicated that most of those

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28 See Figure 16, p. 87.
29 See Figure 11, p. 74.
graduates who left teaching did so within the first two years of teaching. This statement suggests that many of those graduates who leave teaching leave early in their career. The data also indicated that a great number of those who left teaching after the two-year period waited until about the sixth year of service before leaving. In other words, the period in which the next highest rate of attrition occurred took place after the graduate had spent over six years in teaching. These data may suggest that a dissatisfaction with science teaching as a career comes either early during the first two-year period of teaching or much later during the sixth year of service.

Position Stability: Implications for the Group Which Remained and for the Group Which Left Teaching

The data comparing the position stability of those graduates who left teaching with those who remained in teaching indicated that the group which remained in teaching showed a much greater stability in their teaching occupation. These data may suggest that the graduate who indicates position instability by leaving teaching can also be predicted to show an instability in his occupation.

30 Figure 16, p. 87. 31 Ibid. 32 See Chapter IV, pp. 76, 77.
after he leaves teaching. The stability of the group which remained in teaching compared with the instability of the group which left teaching may indicate the degree of satisfaction in teaching as an occupation. The instability which is indicated both in teaching and in other occupations by the group of graduates who left teaching may indicate a dissatisfaction with teaching as an occupation.

The Implications of Teaching Outside the Major Areas for Persistence in Remaining a Teacher

Data were obtained which concerned the teaching done outside the major area of preparation for the group which remained in teaching and the group which left teaching. The data indicated that a higher percentage of graduates from the group which remained in teaching than from the group which left teaching taught outside the major area of preparation. These data suggest that teaching outside the major area of preparation had little effect upon the teaching.\(^{33}\) The small difference in percentages prevents a concrete statement regarding the effect of this factor on the persistence to remain in teaching.

The assumption may be made that the positions available at the time many of the graduates sought positions

\(^{33}\)Ibid., pp. 82, 84, 85.
required experience only in their minor areas of preparation. For this reason many graduates obtained positions in their minor areas of preparation.

Implication of the Attainment of the Position Desired for Persistence in Remaining a Teacher

Certain data were obtained concerning the attainment of a position in science desired by the graduate. The data indicated that a greater number of the graduates who left teaching than of the graduates who remained in teaching never obtained the teaching position they desired. In other words, more of the group which remained in teaching attained a desired position than did the group which left teaching. These data may suggest that a failure in the attainment of a desired position was a factor affecting the persistence with which the science teachers included in this study remained in teaching.

The data indicated that 50 per cent of the graduates who began teaching obtained the position they desired in three years; 66 per cent of the graduates obtained the desired position by the end of the seventh year. These data indicate that one-half of the respondents who began teaching (60) obtained the position they desired in a period of three years.
Teaching Attrition Factors: Implications of the Extent to Which the Various Factors Affected the Teacher Attrition Rate

The data involving the effect of certain factors on the teacher attrition rate indicated that several factors were influential in causing the attrition among science teachers. However, the financial factor and the poor administrative factor were outstanding causes among all the factors. The data not only indicated that these two factors were outstanding among all the factors as causes of attrition, but they were the two primary reasons that the science teachers included in this study left teaching.

The revelation that the financial factor was the foremost causative factor of teacher attrition was not surprising, but it was surprising to find that poor practice in administration would rate second as a cause of attrition.

Another surprising fact was discovered when the reactions of the graduates to the attrition factors were examined. The graduates who left teaching indicated that excessive teaching load was not a factor which affected their decision to leave science teaching. As a matter of fact, the data indicated that this was the only factor in which all of the respondents to the attrition factors gave
instruction in the elementary school.再次，大学和教师预备机构表达了需要改变其课程以满足对小学水平科学教师的需求。教师预备课程再次改变，作为创新次级学校课程的后果，目前在几个教师预备机构的课程。这些课程包括专门为科学教师准备的特定课程，以及围绕一个民主社会的课程，该社会依赖于科学作为推理的方法，以及解决问题的手段，并理解并欣赏生活在自由社会的技术方面。

所有之前提到的因素——个别作者、委员会报告和年鉴——都对不同高等教育机构中的科学教师的准备带来了重要创新的影响。委员会科学教育在美

an answer.\textsuperscript{34} The graduates showed almost unanimous agreement in their reactions toward this factor. The science teachers included in this study decisively expressed the belief that they did not consider the excessive teaching load factor as a cause for their leaving teaching.

The Mental Health Factor: A Pervasive Factor Influencing Teacher Attrition

As the data concerning mental health as an attrition factor indicated, only 2 graduates of the 28 respondents who left teaching listed this factor as the primary reason for leaving teaching. Several graduates indicated that this factor operated in conjunction with the effects of the other factors. These facts may suggest that the mental health factor has a pervasive influence acting with the other factors which cause attrition. It is rather difficult for the investigator to imagine how the factors of family pressure, military obligation, financial worries, or any of the other factors might operate alone as attrition factors without the influence of the mental health factor operating with them. As a matter of fact, the failure of many of the graduates to choose this factor as a reason for leaving teaching may suggest a plausible explanation: that people are often reluctant to admit poor mental health.

\textsuperscript{34}See Table 2, p. 92.
**Inadequate Preparation: Implications as an Effective Attrition Factor**

The data indicated that inadequate preparation as an attrition factor was selected by only two of the group which left teaching. These results may suggest that this factor has very little if any influence as an academic factor which caused the science teachers involved in this study to leave teaching.

"Top Salaried Position" Attainment: Implications for Persistence in Remaining a Teacher

Data were collected in which the attainment of the "top salaried teaching position" for the group which remained in teaching was compared with the attainment of the position by the group which left teaching. The data indicated that more of the group which remained in teaching than the group which left teaching never obtained the "top salaried science position." The assumption might be made that salary was not an important item which operated as an attrition factor because more of those who remained than those who left never obtained the "top salaried position." To the contrary, from other data concerning the financial factor, salary was indicated as

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an important item operating within the financial factor as a contributor to the graduate's leaving teaching. The explanation of these seemingly contradictory results, then, may be that those who remain in teaching are better satisfied with their salary than those who left.

A majority of both groups may not have had the chance for the "top salaried position." In fact, support can be given to this possibility by the fact that most of those who left teaching and a few of those who remained in teaching at the time this study was made had not spent sufficient time in teaching to have an opportunity to obtain the "top salaried position." The data supporting the latter statement indicated that the average time spent in teaching for those who remained in teaching was five years, and for those who left teaching, two years. This evidence suggests that a failure to obtain the "top salaried position" was not a causative factor of attrition among the science teachers involved in this study.

The Effect of the Attainment of the "Highest Prestige Position" upon Persistence in Remaining in Teaching

Certain data were collected concerning the effect of the attainment of the "highest prestige position" upon the

36 See Figure 18, p. 94.
graduate's persistence in remaining in teaching. The data indicated that a greater percentage of the group which left teaching than the group which remained never held the science position of highest prestige. These data may suggest that the attainment of the "highest prestige position" was a factor which influenced the graduate to remain in teaching.

The assumption may be made that none of the existing science teaching positions were considered as prestige positions by those who left teaching. One explanation for this assumption is that the prestige of position may have been evaluated by those who left teaching only on the basis of salary. Evidence to support the latter two statements can be found from the data which indicated that the "top salaried position" was held by more of those in the group which left teaching than the group which remained. This fact indicates the opposite trend from the results obtained in the data analysis concerning the "top prestige position." The latter comparison of data is especially important since salary is often regarded as a prestige-carrying factor. The data concerning positions of prestige and top salary may suggest that "prestige of position" was

37 See Footnote 6, Chapter IV, p. 111.
38 See Chapter IV, pp. 111, 112.
39 Ibid., pp. 101, 102.
held in higher esteem by the graduate who remained in teaching than the graduate who left teaching. A supporting piece of evidence was the fact that four graduates who indicated that they were offered the "top salaried" but not the "top prestige" position refused the offer. Three of these four graduates remained in teaching.

Graduate Work Taken: Implications for Leaving Teaching

The data involving a comparison of the amount of graduate work taken by the group which remained in teaching and that of the group which left teaching indicated that a greater percentage of the group which remained in teaching than the group which left took graduate work. These data indicated that a relationship may exist between the amount of work taken and persistence in remaining in teaching. Actually, most of those who left teaching who took no graduate work did not remain in teaching long enough to take graduate work. The amount of graduate work taken cannot be considered as a causative factor for the student to leave teaching.

Summary

This chapter has dealt with the implications of data involving certain important status problems areas in the

40 Ibid., p. 117.
postgraduate status of the science-education graduate. The data involved the following problem areas: occupational stability; persistence on the part of the science-education graduate in remaining in teaching; the length of time the graduate spent in teaching; the reasons why the graduate left teaching; the quality of position attained by the graduate with respect to prestige and salary; the extent to which graduate work was taken; and specific problems involving individual graduates who showed deviations from the pattern of problems exhibited by the rest of the graduates.

The implications were discussed in two ways: (1) the implications from the data obtained from an examination of the student's permanent records and (2) the implications from the data obtained from the questionnaire.

The following conclusions were drawn with respect to the problem areas from the data obtained from the graduate's permanent record:

1. The men prospective science teachers indicated a greater persistence in remaining in teaching than the women prospective science teachers.

2. The large enrollment may have indirectly caused an increase in the science teacher attrition rate by causing a greater competitive job market for science teaching positions.
3. Stability in the academic preparation based on one transfer prior to graduation probably had very little relationship to occupational stability, but a relationship was suggested between two or more transfers and a predicted instability in the graduate's teaching career.

4. The area of preparation probably exerts no influence as a causative factor of teacher attrition.

5. A deficiency in professional course work as indicated by those graduates who responded did not prevent these students from teaching.

6. Academic success probably could not be used to predict a persistence on the part of the student in remaining in teaching.

7. The O.S.P.E. scores could not be used as a predictor for a career choice for the graduates in this study.

8. Student teaching outside of the major area of preparation probably could not be used to predict that the teacher would leave teaching.

The following implications were provided with respect to the problem area from data obtained through the questionnaire.

1. The responsibility of marriage and children probably should not be considered as a causative factor of attrition.

2. Teachers in the family may have been an influencing factor upon the graduate in remaining a teacher.
3. The level at which the teachers in the family taught may have had some influence upon the teaching level chosen by the science education student.

4. The environment prior to college may have been an influencing factor upon the quality of the position obtained by the graduate.

5. The student from a heterogeneous type of environment may have been more successful in obtaining the better science teaching position than the student from a homogeneous type of environment.

6. No particular pattern or school organization was found as a contributing factor toward the student's leaving teaching.

7. A frequent change in positions was found to occur more often among the group which left teaching than the group which remained in teaching.

8. There was a relationship between the inability of the student to stay in science teaching and the instability in other occupations after he left teaching.

9. The failure to obtain a desired position may have been a factor which adversely affected the student's persistence in remaining in teaching. Most of the graduates who obtained the positions they desired did so early in their career.
10. The most effective causative factors of attrition were the financial and poor administrative factors.

11. Most of the teachers involved in this study indicated that an excessive teaching load was not a factor responsible for their leaving teaching.

12. The mental health factor was a contributing factor to attrition and showed a pervasive influence by acting in conjunction with all the other attrition factors.

13. Inadequate preparation for teaching was indicated by a few of the science teachers in this study to be a causative factor for leaving teaching.

14. Those graduates who left teaching considered salary as the primary basis of evaluating the prestige of a position. Those graduates who remained in teaching did not consider salary as the primary basis for evaluating the prestige of a position.

15. Many of the graduates who left teaching assumed the opinionated position that no science-teaching position carried prestige in the community. Those graduates who remained in teaching indicated that the prestige factor exerted some influence upon their decision to teach.

16. More graduate work was taken by those graduates who remained in teaching than by those who left teaching, primarily because those who left teaching did not spend sufficient time in teaching to take graduate work.
CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

This chapter is concerned with the extent to which certain hypothetical questions proposed in this study were answered. Since answers to these questions were sought through an analysis of the pregraduate and postgraduate status of the science education graduate, they form part of the basic objectives of the study.1

A Numerical Listing of the Problems

The problems in the form of questions are listed numerically in order to draw attention to their importance and facilitate the clarification of their content. Certain aspects of the problems will be discussed which were not dealt with elsewhere in the study. A few of the answers to the problems dealt with in previous discussions will be analyzed as they affect the present discussion. In the

1It will be recalled that these problems were hypothesized at the beginning of the study. The investigator did not know at that time whether the study would supply answers. Several other problems which were discovered in the status analysis ultimately became equally as important if not more important than these problems hypothesized earlier. A consideration of problems in both groups is thus justified.
A Philosophy for the Institution Which Prepares Science Teachers

The preparation of science teachers is approaching a new level of importance in the entire history of our educational system. The survival of the society which provides the preparatory institutions depends upon the effectiveness with which these institutions fulfill their role. It is assumed that the role of these institutions is to produce science teachers who can teach young people to become useful citizens in our society. If this assumption is true, then these institutions must direct their effort toward that end. To carry out their role effectively, institutions must have preparatory programs which will make possible the fulfillment of desired goals.

The primary goal of the preparatory program for science teachers should be to instill in the prospective science teacher the desire to achieve the major objectives of science teaching. Richardson has stated that the science teacher should teach in such ways that students will:

1. Develop the ability to think critically, to use the method of science effectively.
2. Acquire the principles, concepts, facts, and appreciations through which they can better understand and appreciate the nature of the earth, its inhabitants, and the universe.
3. Use wisely and effectively the natural resources of our earth as well as the products of science and technology.
remainder of this chapter a numerical reference will be used in a discussion of these problems.

1. What was the occupational stability of the selected group of science education students who took their pre-service education at The Ohio State University?

2. For what reasons did those students who were successful in their academic preparation leave science teaching?

3. To what extent did preparation beyond the minimum requirements in course work indicate a persistence on the part of the science teacher in remaining a teacher?

4. To what extent did a high point-hour ratio in academic work determine the quality of position obtained by the graduate? As used here quality refers to responsibility, job prestige, and salary.

5. How did the degree of success in the academic preparation affect the attainment of the higher salaried positions by the science education graduate?

6. How did the academic records of those who left teaching compare with the records of those who remained in teaching?

7. Had the science education graduate taken any graduate work? How did the amount of graduate work taken by the student who left teaching compare with the amount of work taken by the graduate who remained in teaching?
8. Did the student who left science teaching have a preservice record which indicated a weakness in his professional preparation?

9. What were some of the problems which affected the stability of the graduate's status as defined in this investigation? Reference is made to the problems which were discovered in the analysis of the postgraduate status of the science education student.

Clarification and Analysis of the Problems

Problem One

Problem One was found to be one of the more critical problems faced by the science education graduate after beginning his teaching career. The answer found through an analysis of the status of the group of teachers in this study was not encouraging from the standpoint of the growth of the science teaching profession. Evidence supporting the latter statement can be found from the fact that 29 graduates of those who entered science education in 1949-1952 and subsequently graduated left teaching. These 29 graduates, representing 48.33 per cent of the respondents to the questionnaire who began teaching after graduating, left science teaching within a period of from two to six years, to engage in other occupations.² These

²See Figure 1, p. 22.
facts present a rather dismal outlook for the future efforts of the institutions which are attempting to meet the demand for teachers in the sciences.

Problem Two

The answer to Problem Two was found to involve many factors either directly or indirectly responsible for the attrition which occurs in the science teaching profession. The two greatest causes as cited by the respondents were the financial and poor administrative practice factors. Other factors indirectly involved in the causes of attrition were mental health, family pressure, and insecurity involving inadequate preparation.

Ironically, the financial and poor administrative practice factors are two of the many causes of attrition which may be isolated. It would seem logical to conclude that the two primary causes of attrition may be isolated more easily than the other less important factors cited by the respondents. This statement is based upon the assumption that these two primary causes would be easier to isolate through a status analysis instrument than the lesser factors. The respondent is more apt to indicate factors which have a material basis. For example, a person is often reluctant to reveal personal or emotional problems which underlie the lesser factors of family pressure, mental health and inadequate preparation.
Problem Three

In attempting to find an answer for Problem Three, several related problems were uncovered. Seeking a relationship between the amount of preparation and a persistence to remain in teaching also involved dealing with other problems such as achievement and type of preparation, found in the analysis of the areas of preparation. The data indicated that neither the amount of preparation nor the type of area in which the preparation was done had any effect upon the persistence of the graduate in remaining a teacher. Academic achievement in preparation was also found to have very little effect upon the graduate's remaining in teaching. However, an indirect relationship may exist between the insecurity caused by a lack of preparation evidenced in the responses of the graduates, and a persistence in remaining in teaching. This statement is based on the data which indicated that this lack of preparation was listed in some of the causes for leaving teaching.

Another support for this relationship might be given in a hypothesis which states that: the belief of

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3 See Chapter V, pp. 132, 133.
4 See Chapter III, p. 39.
5 See Chapter IV, p. 100.
inadequate preparation held by the graduate may have been caused by his failure to properly select his teaching preparatory experiences. On the one hand, there was no evidence to substantiate this belief. On the other hand, it would seem logical to assume that a more careful selection of these experiences might have prevented this belief. If this belief were responsible for his feeling of insecurity, efforts to prevent this belief might have influenced him to remain in teaching. This influence to remain might have been accomplished through a more careful selection of experiences.

**Problem Four**

Problem Four involved seeking any relationship which may have existed between grades and the type of position obtained by the graduate. The data did not furnish sufficient evidence to answer this question conclusively. One of the reasons for the failure to obtain an answer was the inadequacy of the instrument (the questionnaire) used to obtain the data. Without specific information from the employers of the graduates, the data obtained could not be used. The reason for not using the data from the questionnaire was that such information could not be verified without the use of documented records regarding the

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6See Questionnaire, Appendix p. 180
amount of salary and the responsibilities which the position obtained by the graduate entailed. Since the questionnaire was sent to the graduates but not to the employers, such valid information was not available.

**Problem Five**

Problem Five could not be answered because of the limitations in the methods pertaining to the procurement of data. In other words, the questionnaire data did not furnish sufficient evidence to give a conclusive answer to the question. Whether this problem is of sufficient importance to merit further investigation is a matter to be decided after additional studies are made, which will uncover problems related to the relationship between academic preparation and teaching success.

**Problem Six**

With regard to the answer for Problem Six, data from the questionnaire gave evidence which indicated that the academic averages of those graduates who left teaching were slightly higher than for those who remained in teaching. This evidence indicates that there was very little relationship between the academic averages of the graduates and the persistence of the graduates in remaining in teaching.

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7See Chapter III, p. 39.
Evidence is lacking to support the contention that high academic averages affected the persistence with which the graduate remained in teaching. Evidence was also lacking to support the often stated hypothesis that high academic averages can be used as predictors for success in teaching.

Problem Seven

The answer to Problem Seven was obtained in terms of general nonspecific evidence rather than specific quantitative evidence. The data indicated that more of the graduates who remained in teaching took graduate work than those who left teaching. Whether teaching demands professional improvement to a greater extent than that demanded by other occupations is a matter of controversy. The data indicated that those graduates included in this study who considered teaching as their life's occupation by remaining in teaching did strive for professional improvement. In other words, those who left teaching did not improve themselves professionally to the extent of those who remained in teaching. If teaching competence is the result of professional improvement, then the graduates who remained in teaching would have attained a greater degree of competency than those who left for other occupations.

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8See Chapter IV, p. 117.

9Ibid.
Problem Eight

The answer to Problem Eight was obtained from data taken from the student's permanent record. The data indicated that virtually all of the graduates took more than the required number of hours in the area of professional preparation. It is a paradox, however, that there was no evidence that proficiency in professional courses had a desirable effect upon the graduate's choice of science teaching as a career. To the contrary, the data indicated that many of those who left teaching were as well if not better prepared in their professional areas of preparation than those who remained in teaching. The evidence did not support the hypothesis that the extent of professional preparation determined the persistence in remaining in teaching. The fact that evidence was not conclusive may suggest that other variables operate which are determining factors. The desire to teach could be one of these factors.

Problem Nine: Clarification and Analysis

Most of the problems included under Problem Nine or the problems closely related to it have been discussed elsewhere in this study, and reference will be made to

10See Chapter III, pp. 42, 44, 45.
11Ibid., pp. 44, 45.
these problems only for purposes of recognizing and clarifying the problems listed. A few of the more important problem areas related to Problem Nine which are involved in the postgraduate status of the graduate are: the attainment of the kind of position which the graduate desired; the factor of economics; poor working conditions; getting cooperation from those with whom he worked; family pressure to seek higher salaried positions; the effect upon the graduate's status regarding the manner in which he operated within certain administrative rules and regulations; and the extent to which the pressures of his job produced mental stress.

The attainment of a "desired position" by the graduate was one of the important factors found in the analysis of the professional status of the graduate. This factor was especially important in determining the persistence with which the graduate remained in teaching.¹²

The responses of the graduates concerning the attainment of a "desired position" lead to a proposal in this study that the problems involving this factor could be solved if they were only made known to someone other than the graduate who would be in a position to initiate action

¹²See Chapter IV, p. 88.
toward a solution. For example, a hypothetical situation is provided in which the graduate may not know whether the position he really desires actually exists or what the purpose of the appointments bureau is with regard to services which might be available to him. If his desires could be made known to the consultant in the appointments bureau, a position might be obtained for the graduate which would fulfill his desires and thus prevent him from leaving teaching. Recommendations concerning the procurement of the information concerning the science-education graduate who needs help in the latter hypothetical problem and other data concerning the status problems of the graduate will be discussed later in this chapter.

The factor of economics is closely associated with the attainment of a "desired position." As was stated in a previous discussion, the data indicated the student's viewpoint is that salary determines the desirability of a position. The problem of the effect of salary on the desirability of a position has been discussed elsewhere in this study. This discussion suggests that the help in obtaining a "desirable position" which may be given to the beginning teacher would depend to a great extent on the

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13 See Chapter V, pp. 152, 153.
14 Ibid., p. 152.
4. Understand the social function of science and think and act in relation to the implications of science and technology for society.
5. Develop understandings that will contribute positively to their physical and mental health and their recreational interests.
6. Acquire information, understandings and appreciations that will contribute to their educational and vocational guidance.12

The curriculums of the preparatory institutions should provide a means of instilling in their prospective teachers the desire to teach for these objectives. They should provide a variety of experiences through which the prospective science teacher can grow and mature toward the competency needed for effective science teaching.

A program planned to provide effectively for these experiences would contain such areas of preparation as the following: a thorough knowledge of subject matter in the areas in which the prospective teacher intends to teach; an understanding of the psychological and physiological development of youth; instruction in the fundamental methods of teaching as well as the skills peculiar to effective science teaching; and a broad knowledge of the humanities and languages in order that the science teacher might draw upon these areas as the need arises for making his teaching more effective.

salary demanded by him. The information concerning salary demands could be utilized by the appointments bureau consultant in a manner similar to the method described for the attainment of the information concerning a "desired position."

The factors of working with others, pressures of mental stress, family influence, and to the extent which the graduate worked with or against the administration involved personal problems which led to his leaving teaching. These problems have been discussed in detail under the teacher attrition factors. As indicated by the data in Chapter IV, all of these factors were included by the graduates who left teaching as factors having an effect on the persistence to remain in teaching.

One of the important aspects of these factors is how to obtain information regarding their analysis as problems of the graduate. The method of procuring these data is through some method of status analysis. The method of making such an analysis will be discussed under recommendations later in this chapter.

**The Importance of Problem Discovery and Analysis**

The nine problems discussed in this chapter were discovered as factors related to the graduate's status through

\[15\text{See Chapter IV, pp. 91, 93-102.}\]
an analysis of the reactions of the graduate to the questionnaire. The data concerning the causes of attrition among science teachers were obtained through the questionnaire. These data suggest that the degree to which the science education graduate is able to cope with these status problems determines in a large measure whether he will remain in or leave teaching. One reason that more of the graduates do not remain in science teaching may be that they receive very little or no assistance in solving these status problems. Assuming the latter statement to be true, help can be given the graduates only if the problems are discovered and clarified.

If the preparation of science teachers is the responsibility of teacher preparatory institutions, it would seem logical that these institutions should make an effort to keep their graduates from leaving teaching. If the teachers can be prevented from leaving teaching by aiding them in solving their professional status problems, then these status problems must be discovered, analyzed, and solutions provided.

**Recommendations**

It is recommended by the investigator that an instrument be constructed similar to the questionnaire used in this study for the purpose of obtaining data from which a status analysis may be made.
The investigator recommends that the information obtained from the status analysis instrument be made a part of the student's permanent record. This recommendation is made in order that those who serve as consultants at the teacher preparatory institutions may use the information to help solve the status problems of the beginning teacher.

It is further recommended that the status analysis instrument be sent to all science education graduates once each year for a period of five years after graduation. Provision should be made for a shortened form of the status analysis instrument in order that the complete information which is called for on the long form not be given each year unless a change in the status of the graduate has occurred.

It is also recommended that the status evaluation data which are kept as a part of the student's permanent record be made available to the administrators who work with these teachers in the public school systems. This recommendation is made for the purpose of enabling the administrator to (1) know some of the problems of a teacher coming into the school where the administrator works and (2) be better able to help the incoming teacher get oriented in order that these problems be either prevented or minimized.

If these recommendations serve the purpose for which they are intended, it would seem logical to assume that
many of the science teachers who leave teaching could be prevented from leaving the profession.

**Recommendations for Further Study**

The data obtained and analyzed in this study suggest that further study is needed. The study ought to involve the problems of the pregraduate and postgraduate status of the science education graduate. The need for further study should be evident but may need to be reemphasized. The fact that further study is needed is indicated by the many problems which were identified although strict limitations were imposed upon the scope of the investigation in this study. Additional data concerning the graduate's postgraduate status could be obtained by extending the period of study beyond the three years included in this study to include a five-year postgraduate period extending through the current year; by including students for status study who hold a graduate degree; by using other means of obtaining data than the questionnaire; and by using a more efficient method for locating graduates not contacted in this study.

Further study is particularly needed concerning the factors of mental health and its effect upon the student's persistence in remaining a teacher, the administrative practices and their effects upon teacher attrition, and methods of seeking data from administrators which would
aid in clarifying the postgraduate status of the graduate. The latter factor is of utmost importance because neither the Gardner study nor the present study dealt with the persons responsible for the operation of the school systems in which the science education graduate was employed. From the fruitful results obtained by contacting only the graduates, it would seem logical to conclude that a contact of the administrators for the purpose of obtaining the data concerning the postgraduate status of the science education graduate should prove very productive.

Summary

Some of the problems hypothesized at the beginning of this study have been discussed concerning the extent to which answers were found to the problems as a result of the status investigation.

Certain recommendations were made concerning the use of a status analysis instrument. The instrument recommended was in the form of a questionnaire to be used to discover and clarify the problems of the beginning science teacher. These recommendations involved (1) the construction and use of a status analysis instrument; (2) making the status evaluation data a part of the student's permanent record; (3) use of the status analysis data by the consultant to
help alleviate and solve the problems of the beginning science teacher; (4) making the status evaluation data available to the administrator with whom the incoming science teacher works; (5) sending the status analysis instrument to the science education graduate each year for a period of five years; and (6) sending a shortened form of the status analysis instrument each year after the first long form is returned by the graduate, in order that only the data involving changes in the status of the graduate would need to be given by the graduate.

Finally, the need for the status analysis instrument was related to the concerted effort which must be made by teacher preparatory institutions to decrease the attrition rate among science education teachers.


The Ohio State University College of Education Bulletin 1951-52. Published by The Ohio State University, Columbus, Ohio, 1951.


APPENDIX
The program for the preparation of the science teacher should be one which will produce a teacher who believes in the fundamental principle of democratic education, that "... the individual is dynamic, that learning is an active process, that the essence of education is the reconstruction of experience through the method of intelligence. ..."\(^\text{13}\)

**The Need for This Research**

Several facts might be cited to support the belief that research is needed in the postgraduate career of the science education student. First, the diversity of science-preparatory programs attests to the need for a study of the relationship between the kind and amount of preservice preparation and its effectiveness upon the postgraduate careers of science education graduates. Second, the high rate of attrition among science teachers indicates a need for an investigation into the reasons for this attrition. Third, the number of dismissals for incompetence warrant an investigation of the reasons for these failures. Fourth, the sharp attack charging inadequate preparation to which our teacher-preparatory institutions are constantly subjected demands investigation to determine whether the kind of preparation which the prospective teacher receives or other factors not known to

\(^{13}\text{Harold Alberty, Reorganizing the High School Curriculum, p. 50.}\)
To: The Science Education Graduate

Place: The Ohio State University

Subject: Post-Graduate Status of Students in Science Education at The Ohio State University.

Time: A post-graduate period for students who entered the science education program at The Ohio State University during the academic years 1949 through 1952.

This research study is being made as a doctoral dissertation under the direction of Dr. John S. Richardson of the Science Education area with the cooperation of the Records Division of the College of Education at The Ohio State University and Mrs. Marjorie Gardner who is making a parallel study. Although the Gardner study also involves the post-graduate status of students in science education, the body of information dealt with is different from that sought in the questionnaire of this investigation.

It is hoped that through this study the following two objectives will be attained: (1) in general, valuable information will be obtained concerning the post-graduate status of the science education student, and more specifically involving information concerning the length of time the graduate has held a teaching position, the quality of the position secured, and the occupational history of the graduate; (2) a follow-up record of the graduate in science education will be initiated which will lead to the establishment of a permanent and continuous follow-up record system for all future graduates in science education at Ohio State.

Realizing that you might wish to safeguard certain aspects of your personal history, all information given will be held in strict confidence. Your cooperation in filling out this questionnaire carefully will be an important factor for determining the success in accomplishing the above objectives of this study. Your promptness in returning the questionnaire will be deeply appreciated and will speed the work immeasurably.

Sincerely,

Frank M. Dudley
Department of Physical Sciences
The University of South Florida
QUESTIONNAIRE

DETERMINING THE POST-GRADUATE STATUS OF SCIENCE EDUCATION GRADUATES WHO ENTERED THE OHIO STATE UNIVERSITY DURING THE PERIOD 1949-1952

INTRODUCTION

In order to facilitate your completing this questionnaire the questions have been made purposefully detailed, requiring brief answers, so that the demands made on your time be held to the minimum.

I. GENERAL INFORMATION

A. Are you married? Yes No. If you have children, specify the number.
   ____Male ____Female.

B. Family Teaching Background

1. Do you have members of your family (parents, guardians, brothers and/or sisters) who are now or have been teachers? Yes No. Indicate the number and status by placing the number when appropriate in the space indicating the status of the family member.

   a. Father
      (1) Active
      (2) Non-active
      (3) Retired

   b. Mother
      (1) Active
      (2) Non-active
      (3) Retired

   c. Brothers
      (1) Active
      (2) Non-active
      (3) Retired

   d. Sisters
      (1) Active
      (2) Non-active
      (3) Retired

   e. Guardian (male)
      (1) Active
      (2) Non-active
      (3) Retired

   f. Guardian (female)
      (1) Active
      (2) Non-active
      (3) Retired

2. Indicate the field and level of the teaching family member.

   a. Father
      (1) Elementary
      (2) Secondary
      (3) College
      (field)

   b. Mother
      (1) Elementary
      (2) Secondary
      (3) College
      (field)

   c. Science
   d. Mathematics
   e. Language
   f. Humanities
   g. Other (specify)
C. Environmental History

1. In what size community did you spend most of your pre-college life? Check one.
   a. Urban
      (1) Over five thousand
      (2) Over ten thousand
      (3) Over fifty thousand
      (4) Over one-hundred thousand
   b. Rural
      (1) Non-incorporated
      (2) Over five hundred
      (3) Over one hundred

2. What was the economic setting in the community in which you spent most of your pre-college life? Check one.
   a. Industrial
   b. Mining
   c. Agriculture
   d. Natural resources (timber, fishing, etc.)
   e. Other (specify)

3. Indicate the type school system which was predominant in the community in which you spent most of your pre-college life.
   a. Public
   b. Parochial
   c. Private

4. Indicate the type of school you attended for most of your pre-college preparation.
   a. Elementary
      (1) Public
      (2) Parochial
      (3) Private
   b. Secondary
      (1) Public
      (2) Parochial
      (3) Private

5. What is the size of the community in which you are now teaching? Indicate in round figures by hundreds and/or thousands.

6. If you are not teaching at the present time, indicate the size of the community in which you last taught.
7. Indicate the type of curriculum organization in the school system in which you now teach or last taught.
   
a. Three-year high school (6-3-3 plan)
b. Four-year high school (8-4 plan)
c. Six-year junior high-high school (6-6 plan)
d. Other (specify)

8. Is post-high school work offered in the system in which you teach? Specify the type of work offered. (For example post-graduate high school, junior college, etc.)

9. Indicate the predominant ethnic aspects of the community in which you spent most of your pre-college life.
   
a. Balkan-American
d. Latin-American
b. British-American
g. Mexican-American
c. Chinese-American
h. Scandinavian-American
d. German-American
i. Slavic-American
e. Italian-American
j. Other (specify)

10. Indicate the predominant racial group which existed in the community in which you spent most of your pre-college life.
   
a. Caucasian
d. Negroid
b. Indian
e. Polynesian
c. Mongolian

II. OCCUPATIONAL HISTORY

A. How many different teaching positions have you held? Supply the number.
   

B. If you are no longer teaching, indicate the number of jobs you have had since you left teaching; a job being defined here as a piece of work involving full-time employment.

C. Indicate the number of different jobs other than teaching and excluding summer employment you have held while still under a teaching contract; a job being defined here as a piece of work involving part-time employment for which you received pay.

D. How many different summer jobs have you held while still under a teaching contract for the remainder of the year? Use the definition for a job which applied in (C). Indicate the number of jobs and the year you were employed. Example: Summer 1950 (2).

E. In how many different teaching fields of specialization have you taught? This question refers to fields outside the major and minor fields, i.e. social studies, health and physical education, language arts, etc. List the fields.
F. Have you held an administrative position, either part-time or full-time since you began teaching science? An administrative position includes positions as administrative head, principalship, or supervisor which are not included in the regular faculty salary schedule. List the positions held. ___________________________________________________________________

G. If you are not now teaching, how long did you teach? Give the number in years or parts of a year. ___________________________________________________________________

H. Disregarding salary, in which year of your teaching did you obtain the kind of teaching position you wanted most. Specify the approximate time (For example, 1st year, 2nd year, 4th year, never) ___________________________________________________________________

The following portion of the questionnaire applies only to those who have left science teaching.

III. REASONS AND RELATED FACTORS FOR LEAVING SCIENCE TEACHING

(If you are now teaching science do not answer questions in part III.)

A. Did you leave science teaching for a "better" non-teaching job? Place a check in front of the situation which applies.

1. New job paid more salary with fewer hours.
2. New job provided better marginal benefits (insurance, retirement, etc.)
3. New job required more working hours at higher salary.
4. New job paid less salary but required fewer hours.
5. New job required fewer hours with approximately the same salary.
6. New job paid less salary with more working hours.
7. Describe briefly other conditions which apply. ___________________________________________________________________

B. Did you leave science teaching because the teaching load was too heavy. Teaching load refers to total responsibilities and not just the number of courses taught.  __Yes  __No.

C. Do you believe that "poor administrative practices" were partially responsible for your leaving science teaching?  __Yes  __No.

Check any of the following administrative practices which influenced your decision to leave teaching.

1. Non-cooperation in the procurement of equipment.
2. Non-cooperation in the maintenance of equipment.
3. The lack of or improper provision of adequate laboratory time for science students.
4. The scheduling of other curricular activities which interfered with science activities.
5. Imposing extra-duty assignments upon the science teacher.

D. Do you believe that a lack of cooperation on the part of fellow faculty members was a contributing factor in your leaving science teaching?  __Yes  __No.
If you answered (a) in the affirmative, check any items applying to your situation which would indicate a lack of faculty cooperation.

1. Failure of other teachers to recognize science as being as important to the curriculum as other educational activities i.e., band, athletic program, etc.

2. A reluctance of other teachers to allow students to participate in science activities which might curtail activities in their own subject areas. Science activities would include science fair work, field trips, science club work, etc.

3. A reluctance of teachers to give their time and effort to help promote science functions, i.e., science workshops, science fair and club work.

4. Add other factors involving a lack of faculty cooperation.

E. Do you believe that community attitude toward science was a contributing factor to your leaving science teaching? Yes No.

1. Check the factors which entered into your decision to leave science teaching.
   a. Public apathy toward science as a needed part of the curriculum
   b. Public "anti-feeling" toward science teaching brought about by community mores, traditional practices and ideologies which conflict with the teaching of science, i.e., public anti-feel toward teaching evolution, space travel or practicing vivisection.
   c. Refusal of the public to give the science program support and recognition received by other school activities, i.e., vocational, athletic, and music programs.
   d. Add other factors of community attitude which entered into your decision.

F. Do you believe that family pressure was a key factor in your leaving science teaching? Yes No. If (F) is answered yes, check the item which were contributing factors toward your leaving teaching.

1. My parents believed that I should hold a position which would demand a higher salary than that normally received in science teaching.
2. My parents believed the teaching profession was beneath the dignity of the traditional family social position.
3. My parents believed that science teaching made too many demands upon one socially and economically.
4. My parents believed that I should follow the traditional paternal occupation of the family.
5. My spouse (wife or husband, strike out one) exerted a direct influence upon my decision to leave science teaching.
6. Other contributing factors (specify)

G. Do you believe the science teaching position which you left required a depth of knowledge which was beyond the scope of your preparation? Yes No.
H. Was your physical or mental health a contributing factor in your leaving science teaching? ____Yes ____No.

I. Did pressures of a forthcoming military obligation prevent your staying in science teaching? ____Yes ____No.

IV. QUALITY OF POSITION

A. Have you ever held a science teaching position which paid the highest salary for teachers with your experience of all existing science teaching positions in a community? ____Yes ____No.

Indicate the total number of science teaching positions which existed in the community during the time you taught.

1. ____Positions in high school
2. ____Positions in junior high school

B. Have you ever held a position in the science teaching field which was considered to be the position carrying the greatest prestige of all the existing science teaching positions in the community? ____Yes ____No. If the answer is affirmative, describe the position you held by checking the position below as the one which most closely compares with the position you held.

1. ____Department head
2. ____Science supervisor
3. ____Science consultant (resource teacher)
4. ____Science equipment proc
5. ____Other (specify)_______

C. How does science teaching in the community in which you teach or last taught compare in social prestige and salary with other occupations and professions in the community? If you are not now employed as a science teacher, apply this question to the position in the community in which you last taught. Check one of the following occupations or professions which compares closely in salary and prestige to the science teaching position you now hold or last held.

1. ____Common Labor (rough construction, odd-jobs)
2. ____Engineering
3. ____Law
4. ____Medical practice
5. ____Skilled labor (tool and di-worker, cabinet maker)
6. ____Small business ownership
7. ____Other (specify)_______

E. The "best" science teaching position which you have held compares closest in social prestige with a person similar to one of these in the following occupations or professions.

1. ____Bank director
2. ____Bank teller
3. ____Civil-service employee
4. ____College professor
5. ____Engineer
6. ____Minister
7. ____Nurse
8. ____Physician
9. ____Small business owner
10. ____Other (specify)_______
F. Have you ever held the "top salaried" teaching position in the community?  
   Yes  No. If the answer is yes, was this position exclusively in science?  (Some positions are administrative in character). Yes No.

G. Have you ever been offered the top salaried science position in a community? Yes No. If the offer was refused by you, state the reason for your refusal.

V. GRADUATE WORK

A. Have you done any graduate work? Yes No. If your answer is no, answer only part (E). If your answer is yes omit (E), answer (B), (C), (D).

B. List the total number of graduate quarter hours completed. (To obtain quarter hours multiply semester hours by 3/2.)

C. For the areas indicated below specify: (1) the name of the course; (2) level (undergraduate, masters and/or doctoral) and the number of quarter hours credit which the course carried; (3) the year it was taken; and (4) the grade received.

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Year</th>
<th>U M D</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOLOGICAL SCIENCES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATHEMATICS</td>
<td></td>
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<tr>
<td>PHYSICS</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>PROFESSIONAL METHODS, PSYCHOLOGY, ET</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>EARTH SCIENCES &amp; ASTRONOMY</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

D. If you have taken graduate work, state briefly your reason(s) for taking the courses you took.

E. If you have not taken any graduate work give the reason(s) by checking the items applicable.

1. No incentive
2. Change of occupation
3. Financial problems
4. Change of teaching field
5. Distance too great from an institution offering graduate work
6. Other experience more valuable (specify)
7. Illness
8. Military obligation
9. Other reasons (specify)
Dear Science Education Graduate,

Approximately three weeks ago you should have received a questionnaire with a cover letter explaining the nature of the research for which the questionnaire is to be used.

I realize that matters of health, business, and everyday obligations can prevent one from finding time to fill out and return the questionnaire. I would like, however, to impress upon you that your participation in this study is important in the attainment of the goals for which the study is designed.

This study deals with: first, devising a means for providing a follow-up record system of graduates; and second, an analysis of the occupational status of the graduate which could ultimately contribute to the improvement of the preparatory program for the prospective science teacher. Based upon the belief that you are interested in the above two accomplishments, you are being asked to fill out and return the enclosed questionnaire.

Please use the questionnaire enclosed in this communication rather than the former one, if you received one previously, in order that the records of the number of contacts in this writing might be more easily kept.

Your cooperation in giving your time toward the careful reading, filling out, and prompt return of the enclosed questionnaire will be greatly appreciated.

Sincerely,

Frank M. Dudley
Department of Physical Science
University of South Florida

FMD: bm
Dear Science Education Graduate,

You will find a cover letter enclosed which was sent with a questionnaire to a group of science education graduates of Ohio State University, who have had various amounts of teaching experience.

From the information obtained through Mrs. Gardner's study you indicated that you had not taught since receiving your Bachelor's Degree. This communiqué seeks information regarding any change in your occupational status since receiving Mrs. Gardner's questionnaire. Please indicate by checking one of the following categories.

- I have not taught since receiving my Bachelor's degree.

- I have taught since receiving my Bachelor's degree.

Please indicate in the space below a change of address if different from that on the outside envelope.

Your cooperation in answering promptly will greatly facilitate the progress of this study.

Sincerely,

Frank M. Dudley
Department of Physical Science
University of South Florida
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Frank Mayo Dudley
1963
educators are responsible for the failure of the beginning teacher.

This study was undertaken with these four facts in mind and with the hope that an investigation might point the way for more intensive work in the follow-up and analysis of the professional status of science teachers. It is hoped that as a result of the present investigation, those responsible for preparing science teachers may find ways to lower the attrition rate in the teaching profession.

Choice of the Group of Graduates Included in This Study

The graduates chosen for this study were those who were initially enrolled during the three-year period beginning with either the autumn, winter, spring, or summer quarter of the academic year 1949-1950, the autumn, winter, spring, and summer quarter of the academic year 1950-1951 and ending with the autumn, winter, spring, and summer quarters of the academic year 1951-1952. Several reasons were responsible for this choice.

1. These three years represent "peak enrollment years" in science education between 1947 and 1957.  

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AUTOBIOGRAPHY

I, Frank Mayo Dudley, was born in Umatilla, Florida, December 27, 1920. I received my elementary and high school education at Leesburg, Florida, and was graduated from Leesburg High School in 1939.

My undergraduate work was taken at Stetson University, Deland, Florida, The University of Alabama, Tuscaloosa, Alabama, and The University of Georgia, Athens, Georgia. I spent two years in the United States Army after attending The University of Alabama. After returning from military service I entered The University of Georgia, and was graduated with a Bachelor of Science degree in 1947.

I worked as a biochemist in Georgia and Florida until I enrolled as a graduate student at The Ohio State University in 1948. The Master of Arts degree was granted me in March, 1950.

I taught chemistry and physics in the public schools in Ohio for five years before returning to The Ohio State University in 1955-1956 to resume my graduate work. While at The Ohio State University I worked as a research assistant for the Bureau of Educational Research and as a graduate assistant in Science Education.
After completing my residence requirement at the doctoral level I taught chemistry for three years at Palm Beach Junior College in Lake Worth, Florida. I accepted a position in The College of Basic Studies at The University of South Florida, Tampa, Florida, in September, 1960. I currently hold a joint appointment as an Assistant Professor in the Division of Physical Sciences and Evaluation Services at The University of South Florida.

I am married to Elizabeth Sipe Dudley who is a graduate dietitian from The New York School of Dietetics. We have two daughters, Linda Gayle and Eleanor Louise.
2. A three-year period was chosen rather than a one or two-year period in order that an adequate sampling of student cases could be obtained. A longer period of study was avoided in order that more attention might be given to individual cases.

3. The large number of returning veterans enrolled during 1949-1952 provided a variation in social and economic background and in geographical areas of origin leading toward a representation of religious and racial differences.

4. The influence of atomic power and technical advancement was evidenced during the period through the action of various committees and conferences, such as the Conference on Nationwide Problems of Science Teaching in Secondary Schools, to bring about the step-up in effort to produce a greater number of science teachers and to study the problems of science teaching in secondary schools.\footnote{Report of Conference on Nationwide Problems of Science Teaching in Secondary Schools, \textit{Critical Years Ahead in Science Teaching}, p. 7.}

These three academic years produced science teachers who were confronted by the problems studied by these committees.

5. The selection of this particular three-year period allows time for the prospective teacher to have spent four years in preservice preparation and a minimum of five
years in the teaching field after graduation. A five-year postgraduate period was considered necessary to allow for the possibility of change of position.

Statement of General Purpose of the Study

It was the intent of this study to investigate the preservice academic records and the postgraduate status of those students who enrolled in science education during the three academic years, 1949-1950, 1950-1951, 1951-1952, and were subsequently graduated at The Ohio State University. The purpose of the study is to relate certain aspects of the student's accomplishments in his undergraduate program to his subsequent progress as a teacher, including his postgraduate decisions.

Several specific problems related to the general purpose were investigated:

1. What was the occupational stability of the selected group of science education students who took their preservice education at The Ohio State University?

2. For what reasons did those students who were successful in their academic preparation leave teaching?

The term status is used here and elsewhere in this study to mean the position of affairs of the science education graduate. The position of affairs includes the quality of the science position held, that is, the prestige and responsibility carried by the position and the salary which the position pays; the length of time spent in teaching after graduation; the occupational stability, which includes the number of teaching positions held since graduation; and the persistence with which the student remains in teaching.
3. To what extent did preparation beyond the minimum requirements in course work indicate a persistence on the part of the science teacher to remain a teacher?

4. To what extent did a high point-hour ratio in academic work determine the quality of position obtained by the graduate? As used here, quality refers to job responsibility, job prestige, and salary.

5. How did the degree of success in academic preparation affect the attainment of the higher salaried positions by the science education graduate?

6. How did the academic records of those who left teaching compare with the records of those who remained in teaching?

7. Had the science education student taken any graduate work? How did the amount of graduate work taken by the student who left teaching compare with the amount of work taken by the graduate who remained in teaching?

8. Did the student who left science teaching have a preservice record which indicated a weakness in his professional preparation?

9. What were some of the problems which affected the stability of the graduate's status as defined in this investigation? Reference is made to the problems which were discovered in the analysis of the postgraduate status of the science education student.
Limitations of the Study

Certain limitations have been placed on this study.

1. The study includes those students who initially enrolled and later graduated in the preparatory program in science education at The Ohio State University for the academic years, 1949-1950, 1950-1951, and 1951-1952, comprising four quarters -- autumn, winter, spring, and summer in each academic year.

2. The study includes those students from The Ohio State University who were initially enrolled in college work and were subsequently graduated for the purpose of teaching science, those who transferred from one of the departments of science at The Ohio State University, and those students enrolled at other institutions before transferring in either a teacher preparatory program or in a liberal arts program.

3. Students who transferred into the Science Education Program already in possession of a four-year degree will not be considered in this study.

4. Students' records in the Science Education Program at the graduate level will not be considered in this study.

5. The point-hour ratios in the elective subjects were not determined for the students included in this study.
6. The questionnaire used to determine the postgraduate status was sent to the graduates included in this study — but not to the administrators in the school systems where the graduates were employed.

In summary: (1) Change in teacher preparatory programs has been gradual; (2) change often resulted from demands made upon the teacher preparatory institutions by changes in secondary and elementary-school curriculums; and (3) that change was brought about by a variety of factors, such as the influence of writers, organizations, and conferences acting sometimes together and at other times independently of one another.

The philosophy upon which the teacher-preparatory institution should be structured is based upon democratic principles. This philosophy serves as a foundation for a curriculum which embodies experiences that will impart these democratic principles to the student through a thorough preparation in the knowledge and skills of science teaching.

The present study is justified on the basis of finding ways to improve preparatory programs for science teachers. The general purpose of the study, including some specific problems, is presented, and the limitations of the study are stated.
CHAPTER XI
IMPLEMENTATION OF THE STUDY

Although elaborate and often highly accurate records have been maintained of the science-education student's pregraduate status, not much has been done toward establishing a record of the status of these students in the teaching field.

The present investigation and one other study, which will be discussed later in this chapter, represent the first attempts to analyze the postgraduate status of the science education graduates at The Ohio State University. A few other studies have been made which deal only with the pregraduate status of the science education student or with the postgraduate status of the students who prepared in areas other than science education. The discussion which follows will involve these related studies.

Previous Research

The investigation made by Perdew has some bearing on this study.¹ Perdew compared the outcomes of the science

¹George Perdew, "A Critical Study of the Science Education at The Ohio State University" (unpublished Master's thesis, The Ohio State University, 1950), Table of Contents.
education student's preparatory program with twenty-seven criteria for desirable outcomes of the secondary education student to determine how well the student's program met the selected criteria. The Perdew study involved the science education student's preparatory program by studying the preservice phase of the professional status of the student. Perdew used personal interviews to secure his data. The present study differs from the Perdew study basically because it is concerned not only with the pregraduate status of the student but also with the student's postgraduate status.

Lehman made a study which also involved the pregraduate status of the science-education student. The Lehman study involved those students who transferred into science education.² The transfer records of the students included in the study were used as a basis for determining academic difficulty which might have occurred after transfer. The data from the academic records which were used as an aid in clarifying the status problems are the only source of information common to the Lehman investigation and the present study.

Heald made a study which involved both the pregraduate and postgraduate status of the student. This study involved an examination of the academic background of those education students who were graduated summa cum laude and cum laude, to determine the type of job secured by the student and the number of students who did not begin teaching. The Heald study differs basically from the present study because all superior education students regardless of their major area of interest were included in the study, while this study is specifically concerned with all students in science education, both honor students and those with average academic records.

English made an investigation which involved the pregraduate status of the science education student. He studied the intellectual aptitude of students by comparing their scores on the Ohio State Psychological Examination with their academic aptitude based on point-hour ratios. Two major differences between the English investigation and the present study are that (1) the English study was concerned with students in groups differentiated by means of


scores on the O.S.P.E., whereas the present study involves individual cases as well as groups; and (2) the English study involved only the pregraduate status of the science-education student, while the present study involves both the postgraduate and the pregraduate status of the science-education student.

The investigation which most closely parallels the present research was made by Gardner. The Gardner study and the present investigation involve the pregraduate and postgraduate status of the science-education graduate. The Gardner study and the present investigation differ markedly in the manner in which the data concerning the status factors are treated. The Gardner study involved an investigation of the factors of (1) interest development, (2) specific educational employment information, (3) educational subsidization, (4) professional activities, and (5) teaching assignments.

The Gardner study considered group status relationships, the groups being differentiated on the basis of whether or not they had taught.

5 Marjorie Gardner, "A Follow-up Study of the Students Who Have Completed the Under-Curriculum in Science Education at The Ohio State University during the Twelve-Year Period from September, 1947, to September, 1959" (unpublished Doctor's dissertation, The Ohio State University, 1960), chap. v.
THE RELATIONSHIP OF PREPARATION AND PROFESSIONAL STATUS TO THE DECISIONS OF SCIENCE TEACHERS

DISSETATION

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

By

Frank Mayo Dudley, B. S., M. A.

********

The Ohio State University
1962

Approved by

[Signature]
Adviser
Department of Education
In contrast, the present study involves an investigation of the factors of (1) environmental history, (2) quality of position, (3) reasons for leaving science teaching, (4) academic work completed after graduation, (5) the length of time spent in teaching, and (6) factors affecting the persistence in remaining in science teaching.

The present investigation is concerned not only with the status relationships of the two student groups covered by a selected three-year period but also with the status relationships of selected individuals.

Specific Procedures for Implementing the Study

Data from the Permanent Records

An analysis was made of the students' records in the College of Education Records Office at The Ohio State University. This phase of the study involved gathering data of the following kinds: (1) the cumulative-point hour ratios for a four-year period for all students taking four years work at The Ohio State University in the Science-Education Program, beginning with the autumn, winter, spring, or summer quarter in 1949-50 and for the same period in 1950-51 and 1951-52; (2) the cumulative point-hour ratios of those students who took at least one year comprising three quarters in the teacher preparatory program at The Ohio State University; (3) the cumulative
point-hour ratios in science methods courses, pure science courses, and general studies courses for those students mentioned in (1) and (2) during the same period; (4) the Ohio State Psychological Examination scores of all students considered; and (5) an analysis of the student's major and minor areas of preparation.

Data Concerning the Postgraduate Status

A questionnaire was sent to all teachers considered in the study who successfully completed the academic requirements and received a degree. The questionnaire was devised to obtain the following information: (1) a description of the individual's present position; (2) the length of time the individual spent in his present position; (3) the quality of the individual's position with regard to salary, responsibility, and prestige which the position carried in the community; (4) the reason that the individual left science teaching, if such an event occurred; (5) the quality of the teaching position formerly held or currently held, if a position change occurred, and (6) the amount of graduate work the individual completed since he began teaching.  

6See Questionnaire, Appendix, p. 179.
Treatment of Data

Returns from the Questionnaire

The questionnaire used to evaluate the status of the science education graduate was sent with a covering letter explaining the reason for wanting the information to 76 of the 109 graduates. The 76 graduates were selected on the basis of data obtained from the Gardner study which indicated that these 76 graduates had begun teaching.

Explanation of the Involvement of the Groups Included in the Study

The schematic representation of the manner in which the students were involved in the present study appears in Figure 1. The diagram indicates the manner in which the original 109 students have been divided into groups. This scheme of division facilitated the organisation and analysis of the status problems pertinent to the investigation.

Fifty-six responses (73.68 per cent) were received from the total 76 questionnaires sent. Forty-two returns were received as a result of the first mailing. A follow-up letter was sent approximately three weeks after the

7See covering letter, Appendix, p. 179.
8Gardner, loc. cit.
A SCHEMATIC REPRESENTATION OF THE MANNER OF GROUP INVOLVEMENT OF THE STUDENTS INCLUDED IN THE STUDY

109 Students Entered 1949-52

76 Began Teaching from Gardner Data

29 Never taught or unaccounted for

56 Original Responses

4 Additional

60 responses utilized

54 Men

6 Women

31 remained in teaching

29 left teaching

FIG. 1
initial mailing to the graduates who did not respond to the first inquiry. The follow-up letter produced 14 additional returns.

The investigator realized that some of the graduates who indicated that they had not taught at the time the returns from the Gardner questionnaire were received might have begun teaching. Approximately eight months elapsed between the time the Gardner questionnaire was sent and the date that the questionnaire in the present study was sent. A letter was then sent to 31 living graduates who indicated in the Gardner inquiry that they had never taught. Nineteen of the 31 graduates responded. Four of the nineteen graduates were found to have begun teaching after the Gardner returns were received. These four responses added to the 56 returns from the two previous inquiries completed the 60 returns received and utilized in this study.

Summary

This chapter has been concerned with the research related to the present study. Four previous research studies were discussed from the standpoint of the manner in which they are related to the present investigation.

9 See follow-up letter, Appendix, p. 187

10 See letter to Determine the Occupational Status of the Graduate, Appendix, p. 188
Of the research cited, the Gardner study most closely parallels the research in the present study. The Gardner study differs from the present study primarily in the factors investigated in the postgraduate status analysis.

The procedures used to implement the present investigation were outlined and clarified, and the questionnaire returns were analyzed and explained.
CHAPTER III
THE PREGRADUATE STATUS OF THE
SCIENCE EDUCATION STUDENT

Purposes of Selected Data

One of the purposes underlying the selection of the data interpreted in this chapter was to relate certain factors of the pregraduate status of the science-education student to certain aspects of his postgraduate status. The factors from the pregraduate data include (1) general biographical items, such as sex, age, and marital status; (2) specific items related to the students' academic records representing four years of undergraduate preparation.¹ The latter items were selected on the basis of their pertinence to the fundamental problem dealt with in the study, that of obtaining an evaluation of the postgraduate status of the students in science education.

Another purpose served by the data was to clarify problems relating to the postgraduate status of some individuals whose status pattern differed from that of the majority of those included in the study.

¹See Figure 1, p. 22.
In order to further clarify the purpose of obtaining the data dealt with in this chapter, an example is provided. One of the postgraduate status factors with which this study is concerned, for example, is the determination of the reasons which caused the student to leave science teaching. The hypothesis may be advanced that a poor academic background leads to a feeling of incompetence and insecurity which may be a factor responsible for the student's lack of persistence in remaining a science teacher. In order to either validate or disprove this hypothesis, certain facts would have to be selected and utilized from the academic record of the student. These data would be available in the student's permanent record located in the files of the Records Office of the College of Education at The Ohio State University.

The data from the academic record of the student have been used to obtain a comparison between the student's pregraduate status and such postgraduate status factors as quality of position with regard to salary and social prestige; the working conditions involved in the position obtained by the graduate such as teaching load and relationships with the administration and faculty; persistence of the student in remaining in teaching; and the reasons which caused the graduate to leave teaching.
Use of Diagrams and Tables for Clarification

The interpretation of the data used in this chapter is largely of a descriptive nature. Since most of the data from the permanent records are used as a supplement to, and in support of, data obtained from the questionnaire interpreted in Chapter IV, a minimum of statistical analysis is used in the interpretation. When the latter type of analysis is needed for clarity, the data are presented in simple tabular or diagrammatic form.

General Information from the Permanent Records Data

Sex Distribution of Those Who Began Teaching

The sex of the students included in the study was obtained from the permanent records. Of the 109 students who entered science education during the period 1949-1952 and subsequently completed the program, 13 were women and 96 were men. However, the study is concerned primarily with the 60 respondents to the questionnaire who began teaching science after graduation. Of this group, 6 women and 54 men began teaching. This fact perhaps indicates that of the original number in each sex category, the percentage of men (56.25 per cent) who began

\[2\] Ibid., p. 22.
teaching science was greater than the percentage of women (46.15 per cent)\(^3\). A discussion for this difference will be given later in this chapter and in Chapter V.

**Enrollment Distribution by Quarter and Year**

Certain data were obtained with regard to the distribution of the students in the total group (109) who initially enrolled and subsequently graduated, by quarter and year, and their distribution was compared with the total enrollment in the College of Education. The quarterly enrollment of science education students during the period 1949-1952 varies slightly from the total quarterly enrollment of the College of Education for the academic year 1952-1953.\(^4\) A greater number enrolled in science education in the autumn quarter, with a decreasing enrollment in the winter, spring, and summer quarters, in that order. The total enrollment distribution pattern for 1952-1953 in the College of Education was autumn, then spring, winter, and summer in a decreasing order of enrollment. This difference in enrollment pattern may have been due to the

\(^3\)The point must be clarified that the percentage expressions of data used in this chapter and elsewhere in this study are interpreted to the nearest one-tenth of 1 per cent. The percentages are carried to two decimal places in order that the diagrams show a total of 100 per cent.

ACKNOWLEDGMENTS

The writer wishes to express appreciation to those who have provided guidance and encouragement throughout this research study. Dr. John S. Richardson has provided leadership, direction and guidance throughout the writer's graduate program and during the present research investigation.

Two other members of the committee, Dr. Collins Burnett and Dr. Everett Kircher, have given valuable assistance whenever help was requested. Dr. Collins Burnett and his staff in the Records Office of The Ohio State University were particularly helpful to the writer in gathering data in the Records Office.

Those who gave moral support and encouragement were instrumental in the completion of this doctoral program. These include my wife and children and my mother and father.
great competition for admittance to college brought about by the postwar overflow of applicants. When the enrollment in science education was compared with the total College of Education enrollment, it was found that a greater percentage of men than women enrolled in science education. This situation was possibly created by the veterans who returned with the opportunity for a college education under Public Law 346. This law provided money for tuition fees, books, and a subsistence allowance to the veteran for various periods of time based on the length of military service. The law provided for all veterans who served a minimum of one year in the armed forces from 1940 through 1945.

The relative importance of the quarter in which the student enrolled is rather insignificant when compared with the importance of the year of enrollment in terms of the effect of the increase in numbers on job availability. The year of enrollment in science education is important because of its effect upon the postgraduate status of the student four years after his initial enrollment. The increased enrollment during the period 1949-1952 produced a problem of job availability to which further consideration is given in Chapter V.
Academic Environmental Background

Transfer Defined

The term *transfer* is used throughout the present study to mean any student who did not initially register in the Science Education Program at The Ohio State University but transferred either from another college or university campus or from a program or college at The Ohio State University into the Science Education Program. The Science Education Program is a teacher-preparatory program within the College of Education in which the curriculum is specifically designed for the preparation of science teachers. It is necessary to clarify the meaning of *transfer* because several of the 109 graduates studied had begun their education at other colleges and universities and subsequently transferred into the Science Education Program at The Ohio State University. None of the students who transferred during 1949-1952 transferred from an institution where a separate program of science education was provided. The transfer student, then, is any student who officially enrolled in the Science Education Program from another institution or college or from another college of The Ohio State University.
Transfer Data Selection

The data obtained with regard to transfer status were selected to determine the origin of the students enrolled in science education. The following factors were dealt with in the data interpretation: transfer and nontransfer status, the type of program which the student left before entering the Science Education Program, and how many transfers were made before enrolling in science education. The relationship was sought between these factors and the problem of the persistence of the student in remaining in the Science Education Program after he initially enrolled. The primary purpose of selecting the data concerning the transfer of the students was to relate these data to certain factors in the postgraduate status of the students in science education. The latter relationships and the effect of transfer upon the occupational stability of the graduate are discussed in Chapter V.

Transfers and Nontransfers: An Analysis for the Total Group

When the transfer status of the entire group included in this study was analyzed, a most interesting set of data was obtained. Of the 109 students enrolled during the period 1949-1952, 97 students transferred one or more times either prior to or after enrolling in the Science Education Program at The Ohio State University and 12 enrolled
originally in science education without transfer; that is, of the entire group studied, only 11 per cent did not transfer but enrolled initially in the Science Education Program at The Ohio State University. Six of these 12 nontransfer students responded to the questionnaire. Of the 12 nontransfers, 3 never began teaching, 3 of the remaining 9 could not be located, (these data are from the student's permanent record and the Gardner study) and 3 of the 6 who began teaching left for other occupations. One-fourth of those nontransfers who initially enrolled in science education and were graduated remained in science teaching. The possibility may be considered that the 3 students who could not be reached might have remained in teaching in a ratio proportional to those students who replied. If this assumption is made, then less than one-third or at most one student from the three, might be considered to have remained in science teaching.

If those who transferred at least twice are considered from the total group, we find that 24 fall into this category. Of these, 7 (29.10 per cent) remained in teaching. A comparison of this percentage with the percentage of the nontransfers who remained in teaching (25 per cent) may suggest that those students from the group which transferred two or more times showed a greater persistence in remaining in teaching than the nontransfer students. The
latter statement presents a provocative idea which will be discussed in Chapter V.

**Transfers and Nontransfers: An Analysis of the Group Which Remained in Science Teaching and of the Group Which Left Teaching**

Since this study is concerned primarily with the 60 respondents to the questionnaire who began teaching after graduation, the transfer status of this group is of great importance. After the total group of graduates who responded to the questionnaire was divided into the group which remained in science teaching (31 students) and the groups which left teaching (29 students), an analysis of the transfer status of the two groups was made. Of these 60 respondents, 54 transferred one or more times prior to enrolling in science education and 6 enrolled in science education without transfer. The 6 nontransfers were found to be equally distributed between the two groups, 3 in the group which left teaching and 3 in the group which remained in teaching. Each of the remaining members from the two groups, 28 from the group which remained in teaching and 26 from the group which left teaching, had transferred one or more times between the period of their initial enrollment.

5See Figure 1, p. 22.
in a university or college and the time of their graduation from the Science Education Program at The Ohio State University.

The presentation of transfer data for the group which remained in teaching may be misleading up to this point in the discussion. It may seem reasonable to conclude that because the analysis of the status of the two groups showed a similar distribution of the nontransfer students (6), the status analysis for the two groups was the same for the students who transferred. On the contrary, when the students in each group were examined with respect to the number of times that each student transferred, a substantial difference was discovered between the two groups in the transfer status. After the number of transfers was determined for the students in the two groups, the following percentages were obtained: of the students from the group which remained in teaching 67.74 per cent (21) transferred at least once after their initial enrollment; 22.58 per cent (7) transferred twice; no student transferred as many as three times. Three students in the group which remained in teaching showed no transfers after their initial enrollment in college. Of the group which left teaching, 55.10 per cent (16) transferred once, 31.04 per cent (9) transferred twice. Three students from the group which left teaching showed no transfers after
their initial enrollment in college. One student in the group which left teaching transferred three times after his initial enrollment.

The data in Figure 2 indicate that a much greater percentage of the students from the group which left teaching than the students in the group which remained in teaching appeared as transfers in the "twice transferred category." The implications of these data are discussed in Chapter V.

**Academic Background**

**Factors Considered**

Investigation of the factors of the pregraduate status of the group involved obtaining data about each student's academic background. These data were obtained in order to determine the kind of program of preparation which the student obtained prior to his teaching career. They were important from the standpoint of determining any factors which might have influenced the student either to remain in science teaching or to leave the profession. In order to obtain a better understanding of the problems involved in the student's postgraduate status, those factors were considered in the academic background of the student which might have a relationship to the problems of status. For example, the hypothesis was advanced that obtaining a
TRANSFER STATUS OF SIXTY RESPONDENTS

FIG. 2
thorough preparation was a factor which might strengthen the student's feeling of security as a science teacher and foster his desire to remain in science teaching. The hypothesis was also advanced that thorough preparation which might suggest a high level of teaching competency would also affect the student's feeling of security. These hypotheses were tested by comparing the type of preparation and the success of the student in this preparation with the persistence with which he was able to remain in science teaching. The data chosen to accomplish this purpose were the student's choices of major and minor preparatory areas, his cumulative point-hour ratio and major point-hour ratio, the number of hours amassed in his major and minor, and the grade he received in his student teaching.

The Point-Hour Ratio Defined

The point-hour ratio is arrived at in this fashion. One quality point is earned for each hour of "D" grade, two for each hour of "C" grade, three for each hour of "B," and four for each hour of "A." The point-hour ratio is then calculated by multiplying the total hours by the quality points earned and then dividing this product by the total hours taken by the student.

The graduates represented among the two upper categories of the point-hour ratios for the group which remained in teaching (31 graduates) were compared with the
group which left teaching (29 graduates). The upper categories of point-hour ratios included those graduates who achieved a cumulative point-hour ratio of 3.0 to 4.0. Nine graduates (29.03 per cent) from the group which remained in teaching were represented in these two top cumulative point-hour categories. Of the group which left teaching, 11 graduates (37.93 per cent) were represented in the same two categories.

**Point-Hour Ratios: Ratios in the Major and Minor Areas Compared with the Cumulative Point-Hour Ratios**

Forty graduates from the total group of 109 students attained a cumulative point-hour ratio of 2.0 to 2.5, 44 had a cumulative point-hour ratio of 2.5 to 3.0, 20 had a cumulative point-hour ratio of 3.0 to 3.5, and 5 had a cumulative point-hour ratio of 3.5 to 4.0. The validity of using cumulative point-hour ratios as the basis of comparison of the academic success of the two groups (those who remained in science teaching and those who left) is open to challenge: First, the grades received in the elective subjects, subjects outside the major and minor areas, often cause an increase in the cumulative point-hour ratio; and second, an evaluation of the success of the science-education graduate may be on a more solid basis if
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the point hour in the major and minor areas of preparation is used as criterion for the evaluation.

If (as is apt to be the case) a student does his student teaching in his major area, the point-hour ratio he attains in that area will more nearly represent his achievement in the subject area in which he is most apt to teach after graduation. It seems reasonable, therefore, to compare the two groups on the basis of their point-hour ratios in the major area rather than their cumulative point-hour ratios, although every possible relationship should be investigated between academic achievement and the graduate's persistence in the profession.

When the point-hour ratios in the major area of preparation for the group which remained in teaching were compared with the point-hour ratios in the major for the group which left teaching, the former group showed 9 graduates (29.03 per cent) in the category from 3.0 to 4.0, while the latter group showed 14 graduates (48.27 per cent) in the same category; that is, on the basis of point-hour ratios in the major area, those students who left the profession were superior in academic achievement to those students who persisted in the profession. When the cumulative point-hour ratios for all work taken of the two groups were compared, the percentage difference was not so large as when point-hour ratios in the major fields were
used for comparison. It would seem logical to assume that the slight difference in results of the two bases of comparison was due to the effect of the grades made in the elective subjects, an assumption which supports not using the cumulative point-hour ratio as a basis for comparing the academic success of the two groups. In other words, from the comparison of the point-hour ratios in the major areas of the two groups, the evidence suggests that the group which left teaching had a better academic background than the group which remained in teaching. Implications of these findings are discussed in Chapter V.

**Non-science Majors and Minors**

In order to identify the type of preparation received by the graduates, the group of science education graduates included in the present study have been analyzed according to areas of preparation. Of the entire group of 109 graduates, 6 were non-science majors with science minors, while 20 majored in science but minored in non-science subject areas. Of the 20 who minored in a non-science subject area, 10 minored in mathematics, 4 in history, 2 in English, 2 in physical education and 2 in psychology. Since this study is concerned mainly with the 60 respondents of the 76 graduates who began teaching, these 60 are also analyzed according to areas of preparation.
Areas of Preparation Related to the Persistence with which the Graduate Remained in Teaching

One of the intriguing phases of the investigation of postgraduate status was the study of the stability in occupation of the graduate. In order to determine the factors which serve to reduce the occupational stability of the graduate, the type and amount of success in his academic preparation must be critically scrutinized. For this reason the various subject areas of science in which the science education student prepared were analyzed. The occupational stability of the graduates was examined in order to determine the extent to which a particular area of preparation might have influenced this stability.

During the period studied in this investigation, the following major areas of preparation were available to the science-education student at The Ohio State University: biological science, physics, chemistry, a physics-chemistry combination, a general science major which included subject matter in physics, chemistry, and biology, and a dual preparatory program including preparation in both the secondary and elementary fields. Preparation in the elementary field usually involved an extensive preparation in the general science area.

Of the total 109 students considered in the study, 63 took general science as a major, 23 took biological
science as a major, 5 majored in physics, 11 majored in chemistry, 5 took the physics-chemistry combination, and 2 prepared in both the elementary and secondary fields of science.

Areas of Preparation for Those Who Left and for Those Who Remained in Teaching

A further analysis of the 60 respondents, the group which remained in teaching and the group which left teaching, indicated a distribution of the graduates among the several subject-area majors as follows: Of the group which remained in teaching, 19 majored in general science, 8 in biological science, 3 in chemistry, and 1 in physics; of the group which left teaching, 17 majored in general science, 6 in biological science, 4 in chemistry, and 2 in the physics-chemistry combination. These figures may suggest that no particular area of preparation was found as a characteristic background for those students who left teaching. Table 1 shows a comparison of the two groups with regard to the areas of preparation. The implications of the data presented in Table 1 will be discussed in Chapter V.

Hours Taken in the Professional Area

Since the number of hours taken in the major or minor area is somewhat controlled by the minimum requirements of
### TABLE 1

THE MAJOR AREAS OF PREPARATION FOR THE SIXTY RESPONDENTS IN RELATION TO THEIR OCCUPATIONAL STABILITY

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<th>The Group Which Remained In Teaching</th>
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<th>The Group Which Left Teaching</th>
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<td>General Science</td>
<td>17</td>
</tr>
<tr>
<td>8</td>
<td>Biological Science</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>Physics</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>Physics-Chemistry</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total 31</strong></td>
<td></td>
<td><strong>29</strong></td>
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the University, to list the hours would be irrelevant to the study. However, some insight may be gained into certain of the postgraduate problems by a comparison between the group which remained in teaching and the group which left teaching with respect to the number of hours taken above the minimum requirements in each major area.

The minimum requirement for a major during the period 1949-1952 was 37 to 43 quarter hours for a program with a major and two minors, and 61 quarter hours for a program in which a general science major was taken. The minor area required from 23 to 28 quarter hours. Of the 31 graduates in the group which remained in teaching, 7 took between 40 and 50 hours, barely exceeding the minimum requirements. Of the 29 graduates in the group which left teaching, 7 graduates took between 40 and 50 hours in their major area of preparation.

When the two groups were compared on the basis of the number of hours attained in the professional area of preparation, the results of the comparison proved most interesting. The minimum requirement for the professional subjects area was 43 quarter hours. For the group which remained in teaching, 19 (61.29 per cent) of the 31 graduates

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7 Ibid., pp. 65-69.
took between 40 and 50 hours in the professional preparation area. Of the group of 29 graduates who left teaching, 18 (62 per cent) took between 40 and 50 hours in the professional subjects area. The implications of a comparison between the two groups based on the figures representing the hours taken in the major content area and the hours taken in the professional area of preparation will be discussed in Chapter V.

**Academic Success in Student Teaching**

One of the important phases of the science education student's undergraduate preparation is his student teaching experience. The hypothesis may be advanced that the degree of success in this phase of the student's undergraduate program would be a very important factor in his decision to remain in science teaching.

In order to test this hypothesis, the grades received in student teaching of the group which remained in teaching were compared with those of the group which left teaching. The two groups were analyzed to determine which group had the greater number of graduates with grades of "C" and below and which group had the greater number of graduates with grades of either "B" or "A." For the group which remained in teaching 3 (9.90 per cent) had grades of "C" or below and 28 had grades of "A" or "B." Of the group
which left teaching 2 (7.59 per cent) had grades of "C" or below and 27 (92.41 per cent) had "A" or "B" grades. As the data for the two groups with regard to success in student teaching indicate, the difference between the groups was not appreciably great. The implications of these data are discussed in Chapter V.

It is interesting to note that one of the two graduates in the "C" or below category from the group which left teaching had a "D" grade in student teaching. Further discussion of this case will be provided later in this chapter.

O.S.P.E. Defined

The Ohio State Psychological Examination, hereafter referred to as the O.S.P.E., is divided into five percentile rankings as follows: the lowest rank, rank five, includes percentile scores from 1 through 5; rank four includes scores from 6 through 25; rank three, scores from 26 through 75; rank two, scores from 76 through 95; and rank one, scores from 96 through 99. The examination consists of items involving reading understanding, vocabulary knowledge, and numeral proficiency.  

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8This information was obtained from the Records Office of the College of Education of The Ohio State University.
The O.S.P.E. may be properly classified as an intelligence examination. Every student enrolling in The Ohio State University is required to take the O.S.P.E. unless special permission for a waiver is granted by the University Admissions Board. The scores on this examination are used as part of the criteria in the selection of the students admitted to the University. Although the College of Education at The Ohio State University uses the score results as a criterion for selection, other data are used to supplement the score results. A student is not prevented from enrolling in the College of Education because of a low O.S.P.E. score alone, but only if the score is in the two lowest percentiles (ranks four and five) and other criteria also indicate that he would not be able to do college level work. Other criteria of selection include physical examination results, speech competency, and recommendations from the faculty adviser to whom the student is assigned.

An analysis of the O.S.P.E. scores was made in order to determine any relationship which the scores may have to the ability of the graduate to obtain and hold a "top quality" science teaching position. The "top quality" position is defined as the position which carries the highest prestige, greatest responsibility, and pays the highest salary of the positions available to the graduate.
The numbers of students that made scores in the upper and lower two percentile ranks of the O.S.P.E. were determined for the group which remained in teaching and the group which left teaching, and the two groups were then compared.

**O.S.P.E. Scores: Analysis for the Group Which Remained and the Group Which Left Teaching**

The number of students found in the two upper and two lower percentile ranks for the group which remained in teaching were 3 graduates (9.60 per cent) in the lower fourth and fifth percentile ranks, and 18 graduates (58.06 per cent) in the first and second percentile ranks. Sixteen graduates (55.10 per cent) in the upper first and second percentile ranks and 3 graduates (10.34 per cent) in the fourth and fifth percentile ranks were found for the group which left teaching; that is, the two groups show very slight differences in the percentage of cases found in the two lower and two higher percentile ranks. An interesting fact obtained from the examination of the O.S.P.E. scores was that one student with a percentile score of 5 in the fifth rank remained in teaching. The implications of the above data will be discussed in Chapter V.
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Individual Case Deviations

Deviations in Achievement in Student Teaching

Several individual cases are described here because they represent deviations from the normal pattern set by the rest of the graduates included in the present study; that is, these cases vary from the normal pattern with regard to data obtained from an analysis of the factors affecting the pregraduate and postgraduate status of the graduate.

Only one student of the 109 student cases included in the study received a grade of "D" in student teaching. This student began teaching in science but left his position after the first year and began teaching mathematics, the position which he continued to hold for six years. It is interesting to note that this student did his student teaching in the mathematics area.

Of the 6 respondents who received a "C" grade in student teaching in science, 3 remained in teaching and 3 left science teaching. Of the 3 who remained in teaching, 2 took from five to eight hours in addition to the normal student teaching requirement. The 3 who left took no additional work in student teaching. In each instance

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9During the period from 1949 through 1952 the student teaching requirement varied from seven to twelve hours.
where the additional work was taken, a grade of "B" or better was received in the hours taken above the student teaching requirement.

**Deviations from the Group Pattern with Regard to the Major and Cumulative Point-Hour Ratios**

Among the cases which showed a deviation from the group were those who received considerably higher grades in their elective subjects than were received in the subjects in the major areas of preparation. These data were obtained by comparing the point-hour ratios in the major with the cumulative point-hour ratios. Five graduates received higher grades in the elective subjects than in the major area subjects. These 5 graduates maintained a cumulative point-hour ratio which was three-tenths of a quality point higher than the point-hour ratio received in the major area. The fact that all 5 graduates remained in teaching may suggest a relationship between the graduate's academic achievement in the major subject area and his persistence in remaining in teaching. Another interesting discovery related to these data was that only 1 of these 5 graduates majored in an area other than science. This graduate took a double major, majoring in mathematics as well as physics.
Student Teaching in the Minor Areas

Students who did student teaching in their minor area rather than their major area of preparation present another deviation from the normal group pattern found in the science student's academic record. Of the 60 respondents, 12 did student teaching outside of their major areas. Of these 12 graduates, 8 did their student teaching in mathematics, 2 in biology, 1 in English, and 1 in history. Of this same group, 7 began their teaching in science and remained in teaching. Of the 5 who left science teaching, 2 changed to the area in which they did student teaching, namely English and mathematics. These data may suggest that a relationship exists between student teaching done by the science student outside of the major and his persistence in remaining in teaching.

Professional Course Work Deficiencies

Of the 60 respondents, 2 took less than 40 hours in the professional courses area.10 These graduates took 34 and 36 hours, respectively. One began teaching (probably on a temporary certificate) but left teaching for a

10 The requirement for professional courses during the period 1949-1952 varied from a minimum of thirteen hours to a minimum of eighteen hours including student teaching and excluding content courses in the major area of preparation.
job in industry; the other graduate began as a substitute teacher and was still engaged in active teaching at the college level at the time the questionnaire was returned. This graduate took a major in chemistry and mathematics, while the graduate who left teaching took a major in biology and a minor in psychology. The data from these two cases suggest an interesting possibility of relationship between the graduate's professional background and his persistence in remaining in science teaching. This relationship will be discussed in Chapter V.

**Summary**

The data discussed in this chapter, those secured from the student's permanent records, were used primarily to supplement and clarify the data obtained from the questionnaire interpreted in Chapter IV. These academic data have been related to certain problems discovered through an analysis of the postgraduate status of the science education student in order that the problems may be clarified.

The selected data included general information items such as sex distribution of those who began teaching and enrollment distribution by quarter and year; transfer data for the group which remained in teaching and the group which left teaching; academic background data such as the point-hour ratios in the major and minor areas, cumulative
point-hour ratios, hours of credit amassed by the graduates, and the grades received by the graduates in specific areas of preparation.

Data were also obtained which permitted a comparison of the scores made on the O.S.P.E. by the group which remained in teaching and by the group which left teaching.

There is also brief discussion of the individual cases which deviated from the normal pattern exhibited for the group of graduate students. These individual cases dealt with students who did student teaching in the minor rather than the major area of preparation; indicated a deficiency in the professional methods courses; and received grades in student teaching which were below the standard recommended for teaching competency.

These data were interpreted in the light of the problem areas analysed in the postgraduate status of the graduates. These areas include the quality of teaching position attained by the graduate, the persistence of the graduate in science teaching, and the length of time the student remained in teaching after his career began. Further elaboration and clarification of these problem areas and the isolation and interpretation of the data related to specific problems of the postgraduate status are provided in Chapter IV.
CHAPTER IV
THE POSTGRADUATE STATUS OF THE
SCIENCE-EDUCATION GRADUATE

This chapter deals with the determination of the postgraduate status of the graduates who entered The Ohio State University Science Education program during the period from 1949 through 1952 and subsequently graduated; an interpretation of the data obtained and the ways in which the data apply to the various problems under consideration in the dissertation; and a clarification of the reasons for selecting the particular data studied. The data presented in this chapter have been expressed in both diagrammatic and tabular forms, when a verbal description seemed inadequate to explain a particular set of data. In order to gain a better understanding of the data, the results have been considered in several ways.

The Data: Their Organization and Treatment

The data, with a few exceptions which are pointed out in the footnotes, were obtained from the questionnaire which has already been described in Chapter II under "Procedures for Implementing the Study." A copy of the questionnaire has been included in the Appendix.
The data with which this chapter is concerned are divided into five major groups to facilitate a better organization for the interpretation. Group A includes general personal information, such as sex, family background, environmental history, and occupational environment factors; Group B relates to occupational history; Group C includes data relating to the factors which contributed to the graduate's leaving science teaching; Group D includes the data relating to the quality of the science position held by the graduate; and Group E includes data pertaining to the academic work done since the graduate received his Bachelor's degree. The five groups of data will be dealt with in the order in which they are listed.

**Group A: General Background Information**

**How the Data Are Used**

A possible contributing factor in this study is the background or environment and culture of the prospective science teachers. Therefore, it is desirable to determine any existing differences in this background between the science teachers in this study and other university graduates who sought professions and occupations other than science teaching. It was hypothesized by the investigator that some significant environmental patterns might be found
which are unique to these graduates who sought science teaching as a profession.

A Division of the Total Group for Analysis

Of the group originally enrolled in science education during the academic years from 1949 through 1952, 109 were graduated. Of this number, 13 were female and 96 male. Of the total group, 80 began teaching. It is interesting to note that only 6 of the original 13 female graduates ever taught.\(^1\) The significance of this fact will be dealt with in greater detail in Chapter V.

Of the 80 known to have began teaching, 60 responded to the questionnaire. These respondents will be referred to frequently in this chapter as "the group which taught." This group is further divided into those who remained in teaching and those who left teaching.\(^2\)

Marital Status of Respondents

Seventy-six per cent of the respondents from the "group which taught" indicated they were married at the time the questionnaire was sent.\(^3\) The insignificance of marital status as a factor affecting position quality is rather obvious, but marital status as a factor of family

\(^1\) See Figure 1, p. 22.  
\(^2\) Ibid., p. 22  
\(^3\) See Gardner Study, p. 18.
responsibility affects the persistence of the individual in remaining a teacher. The significance of the latter statement will be discussed in Chapter V. Another item pertaining to the general information data was the number of children indicated by the group which taught. Fifty-six per cent of the group indicated to Gardner they have from one to three children. At the time of this study, 57% of those who left teaching and 62 per cent of those who remained in teaching reported a family of from one to three children. The implications of this statement are discussed in Chapter V.

History of Teachers in the Family of the Graduate

In order to determine the significance which family environmental influences might have on science-teacher attrition, data were obtained pertaining to teaching as an occupation of the members of the immediate family of the science teachers included in this study. Hereafter such persons either active or inactive as teachers will be referred to as "teachers in the family." The word attrition is used here and throughout this chapter to mean a gradual depletion of the total number engaged in the science-teaching profession. Figure 3 clearly indicates that a majority of the respondents from the group which taught (61.66 per cent) showed no previous history of
PERCENTAGE OF GRADUATES INDICATING A HISTORY OF TEACHERS IN THE FAMILY

1.67% NO RESPONSE

36.67% SHOWED A HISTORY OF TEACHERS IN THE FAMILY

61.66% NO TEACHERS IN THE FAMILY

FIG. 3
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teachers in the family. Of the group which remained in teaching, 37.50 per cent showed a previous history of teachers in the family, while of the group which left teaching 28.57 per cent showed a previous history of teachers in the family. The implications of these percentages for the two groups will be dealt with in greater detail in Chapter V. The effect of the "no responses" in the group which left teaching outnumbered the "no responses" in the group which remained in teaching, the margin of difference between the two groups was so small that the results would not have been changed significantly by correcting for the "no responses." The "No Response Correction Method" will be discussed later in this chapter.

Teachers in the Family: Active, Inactive Status

Figure 4 presents a different aspect of the relationship of these and some other related data. The teachers in the family of the group which taught divide into two groups, those who are still active in teaching and those who are no longer active. The group of active teachers (22) of 17 respondents is further analyzed into kinship types. It is apparent from Figure 4 that mothers comprise the largest portion and wives and mothers comprise the largest portion and wives and

4 The percentage expressions of data used in this chapter and elsewhere in this study are interpreted to the nearest one-tenth of 1 per cent. Two decimals are used to obtain a total of 100 per cent.
guardians the smallest portion of the active group. This relationship is indicated by a comparison between the group which left teaching and the group which remained in teaching with regard to the teachers in the family actively engaged in teaching. The results indicated that 25.80 per cent of the group which left teaching had active teachers in the family and 28.12 per cent of the group which remained in teaching had active teachers in the family.

**Teaching Level of Teachers in the Family**

Figure 5a indicates that the greater number of teaching family members, both active and non-active, are teaching or had taught at the secondary level (48.0 per cent) and the least number (4.0 per cent) of these teaching family members taught at the college level. Figure 5b shows that mathematics and humanities were the subject areas in which most of the teachers in the family taught. Twenty-five per cent of the entire group of teachers in the family taught in each of these subject areas. Science and mathematics were the next most highly represented subject areas; 18.7 per cent of the group of teachers in the family taught in each of the latter two areas at all levels. The commercial subjects and physical education areas were indicated as the areas with the poorest representation among the teachers in the family group.
PERCENTAGE OF GRADUATES INDICATING TEACHERS IN THE FAMILY ACTIVELY ENGAGED IN TEACHING

- 5.89% WIFE - GUARDIAN
- 17.65% SIBLINGS
- 29.4% FATHERS
- 47.06% MOTHERS
- 3.34% NO RESPONSE

WITH NO TEACHERS IN THE FAMILY

ACTIVELY ENGAGED IN TEACHING

FIG. 4
5-a. Educational levels at which teachers in the family taught

- 48% Secondary school level
- 20% Elementary school level
- 4% College level
- 28% Non-specified

5-b. Subject areas taught by teachers in the family

- 25% Taught Humanities
- 18.75% Taught Science
- 18.75% Taught Physical Education, Commercial, etc.
- 25% Taught Mathematics
- 18.75% Area not specified

FIG. 5
Environmental Background

The set of data involving the environmental background was collected for the purpose of determining, first, whether the size of the community in the precollege environment of the graduate was a significant factor in determining the size of the community in which the graduate obtained a teaching position; and second, whether the previous environmental community life was a factor which affected the quality of the positions sought and/or obtained by the graduate. Figure 6 shows the percentage distribution of the respondents from the group which taught (60 teachers) among the various community sizes represented in the environmental backgrounds of the graduates. This figure indicates that the largest percentage of the group spent most of their precollege life in the large urban-type community environment, while a much smaller percentage of the group spent their precollege life in a rural environment. Figure 7 furnishes data for any significant relationship which may exist between the size of the precollege community environment and the postcollege community environment where the graduate obtained a position. In Figure 7a the percentage representation is given of the group which taught, showing a distribution of the group among the communities of various size in the precollege environment. Figure 7b shows a similar percentage
SIZE OF THE COMMUNITY WHERE THE GRADUATE SPENT MOST OF HIS PRECOLLEGE LIFE

31.67% 100,000 OR MORE POPULATION

21.67% 10,000 - 50,000 POPULATION

13.33% NON-INC. < 5,000

11.67% 500-1,000 INC. POP.

6.66% NO-RESPONSE

5% 100-500 POP.

5% 5,000-10,000 POA.

5% 50,000-100,000 POA.

FIG. 6
COMPARISON IN SIZE OF THE GRADUATE'S PRECOLLEGE COMMUNITY RESIDENCE AND POST-COLLEGE TEACHING COMMUNITY RESIDENCE

a.

16.67% PRE-COLLEGE SEMI-RURAL

3% PRE-COLLEGE RURAL

75% PRE-COLLEGE URBAN COMMUNITY RESIDENCE

5% NO RESPONSE

b.

18.33% POST COLLEGE RURAL

5% NO RESPONSE

63.31% POST COLLEGE URBAN COMMUNITY RESIDENCE

13.33% POST COLLEGE SEMI-RURAL

FIG. 7
distribution of the same group among the communities repre-
senting the postcollege environment.

Figure 7 indicates that the majority of the group who
taught resided in a large urban community both prior to
college and after a teaching position was obtained. The
fact that the postcollege rural residence increased in
percentage markedly over the precollege semi-rural and
urban residence after graduation is worth noting. The
questionnaire furnished data which indicated that a greater
percentage of the graduates from the rural environments
filled the 31 per cent rural positions than the percentage
of graduates from the urban environments. The significance
of the latter statement will be discussed in Chapter V.

The Characteristic Type of
Economic Community

Certain data were obtained with regard to the economic
environment in which the graduate spent most of his pre-
college life, to determine any relationship which may
exist between them and the data concerning the type of
community in which the graduate obtained a teaching posi-
tion. Figure 8 indicates the different types of economic
communities in which the graduates in the group which
taught spent most of their precollege life. The industrial
area was the most characteristic type of economic environ-
ment and the mining area the least characteristic type of
environment found among the community backgrounds of the graduates. These data also permitted a comparison in community background of the group which never held the teaching job with the highest prestige in the community, with the group which had held such a position. It was desired to determine whether such a comparison might reveal a difference in competitive job-quality attainment between the two groups.

**Ethnic Group in the Environment**

The ethnic group refers to the nationality and racial groups found in the precollege environment of the science education graduate.

The data involving the ethnic-group backgrounds of the graduates were obtained for reasons similar to those given for the data dealing with the economic environment, that is, to show any relationship which might exist between the quality of position sought and/or obtained by the graduates and the ethnic groups in which the graduate spent most of his precollege life. The ethnic backgrounds of the group who taught are diagrammatically depicted in Figure 9. The figure indicates that most of the graduates spent their precollege life in an environment characteristically comprised of people of Western European origin. Although not indicated by the figure, 20 per cent of the group of
THE ECONOMIC STRUCTURE OF THE COMMUNITY WHERE GRADUATE SPENT MOST OF HIS PRECOLLEGE LIFE

58.33% INDUSTRIAL

26.67% AGRICULTURAL

3.33% MINING

6.67% OTHER ECONOMIC STRUCTURES

1.67% NATURAL RESOURCES

3.33% NO RESPONSE

FIG. 8
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ETHNIC ASPECTS OF PRE-COLLEGE COMMUNITY LIFE OF GRADUATE

FIG. 9
graduates who taught (60) indicated no single dominant ethnic background.

Another environmental factor not shown in Figure 9 but pertaining to these data was obtained when the ethnic environment of those graduates who held the "top quality position" was compared with that of the group which never obtained this position. The "top quality" position refers to the position which carried the highest prestige and responsibility and paid the highest salary. Fifty percent of the group which had held a "top quality position" indicated a precollege environment of a single dominant ethnic group. Seventy-three and six-tenths percent of the graduates from the group which never held the "top quality position" showed a single dominant ethnic background. In other words, of those graduates who held the better position, a greater percentage came from a heterogeneous environment, than from a single dominant cultural environment.

Racial Background Data

Data involving the racial community background of the group which taught indicated that 86.67 percent of the graduates from the group spent most of their precollege life in a predominantly Caucasian community, 3.33 percent spent most of their precollege life in a predominantly Negro community, while 10 percent either gave no response
to the question, or spent most of their life in communities of mixed racial structure. These data were obtained to show any relationship which may have existed between the racial community backgrounds and the quality of the position obtained by the graduates. Because only two types of racial groups were indicated in the racial background data of the graduates, the significance of this relationship was diminished.

Group B: Occupational History

School System Organizational Pattern

The data concerning the occupational history of the graduates were obtained in order to determine the quality of position obtained by the graduate, and the relationship which may exist between these data and the persistence of the graduate in remaining in teaching. In Figure 10 the type of organizational system in which the graduate taught is indicated. From the figure it may be observed that a larger part of the group which taught (60 graduates), taught under the "6-3-3 plan" than under any other plan of school organization. The 6-3-3 plan involves a grouping of the first six grades into a single unit, with a separate three-year junior high school and a separate three-year high school comprising the upper units of the system. As indicated in Figure 10, 41.67 per cent of the respondents
ORGANIZATIONAL PATTERNS IN WHICH GRADUATES ARE NOW TEACHING OR LAST TAUGHT

FIG. 10
(60 graduates) taught in this system. It may be interesting to point out also that 10 per cent of the group who taught (60 graduates), taught in a system under the 6-4-2 plan, while 3.57 per cent of the members of the group which left teaching (29 graduates) taught under the latter plan.

An important fact which may relate to the attrition problem in science teaching is that 39.28 per cent of the group which left teaching taught in a 6-3-3 type system.

**Occupational Stability:**

**Purposes of Data**

The fact should be clarified that the position changes indicated in Figure 11 refer to public-school positions. Data were sought also for the position changes of the graduates who taught in private and parochial schools. At the time the questionnaires were sent, no respondent indicated that he was teaching or had taught in the latter two systems.

Figure 11 indicates the percentage of graduates in the groups which taught (60) who changed teaching positions one or more times during their teaching tenure. In order that the information indicated in Figure 11 not be misleading, further explanation is needed concerning the group which left teaching. The comparative ratios between the various position changes probably would have been greater in each category -- for example, the percentage difference
TEACHING POSITION CHANGES BY THE GRADUATE IN PUBLIC SCHOOLS

53.33 %
ONE POSITION CHANGE

23.33 %
2 POSITION CHANGES

11.67 %
3 POSITION CHANGES

6.67 %
4 OR MORE CHANGES

5 %
NO RESPONSE

FIG. 11
between one position and four or more position changes --
if the group which left teaching had been excluded in
figuring the percentages. The reasoning on which this
statement is based is that the time spent in teaching by
those who left was of such short duration (often less than
one year) that the time for a position change was not suf-
ficient. Public-school teachers usually are not permitted
to change positions during the regular nine- or ten-month
teaching term. As a result of the short period of teach-
ing, the persons who left teaching before a teaching year
was completed were included with the "no response group."
This method of presenting the data affected markedly the
over-all percentage figure.

The data involved in Figure 11 were obtained to show
the job-stability status of the graduate. The figure
indicates that over half (53.33 per cent) of all those who
taught changed positions at least once from the time they
began teaching after graduation until they left teaching,
or until they responded to the questionnaire. This figure
reveals data of great importance for the attrition problem
in science teaching and will be dealt with in Chapter V.

The average length of teaching time for those grad-
uates who left teaching was found to be two years. The
figure representing the average teaching time for the
group which remained in teaching could not be verified.
although an approximate figure of five years was obtained from the data involving summer jobs held while the graduate was still under a teaching contract. The "five years" is only an approximation because all respondents did not begin summer work that summer following the school year in which they began teaching. A few graduates also indicated that they began teaching, stopped for one or two years, and then resumed teaching.

**Position Stability for the Group Which Remained and the Group Which Left Teaching**

Figure 12 indicates the number of nonteaching jobs held by the graduates in the group which left teaching. This group (29 cases) represented 48.34 per cent of the group of respondents who taught (60 cases). The figure indicates that 16.67 per cent of the graduates in the group which left teaching had one position change after leaving the profession, and 10 per cent had two or more job changes. These data were obtained in order to determine the occupational stability of the graduate after leaving teaching.

A significant aspect of these data is revealed if the stability of the group which left teaching is compared with that of the group which remained in teaching. Figure 12 indicates that 11.67 per cent of the group which left teaching had no position changes, or showed permanent occupational stability, while 67.47 per cent of the
respondents from the group which remained in teaching indicated a permanent occupational stability. The last percentage figure does not appear in Figure 12.

A comparison of the percentages for the two groups might be slightly misleading, unless the "no response group" is considered in computing each of the percentage figures. The "no responses" from the group which left teaching comprise 10 per cent of that group, while the "no responses" from the group which remained in teaching comprised 6.45 per cent of the group. However, the "no responses" for the two groups are of such small magnitude that they would make no appreciable change in the comparative percentages.

Summer and Part-Time Employment While Teaching

Certain data were obtained with regard to the number of jobs held by the graduate during the time that a full-time teaching position was held. These data are divided into two categories on the basis of those jobs which were performed during the teaching year, usually on week ends or in the afternoons and evenings, and those jobs which were held during the summer following each normal nine- or ten-month teaching year. A job was defined for the graduate as a piece of work involving part-time employment for which pay was received. The data were obtained for the purpose
NUMBER OF POSITION CHANGES OF GRADUATES
AFTER LEAVING TEACHING

16.67% 1 POSITION
11.67% NO POSITION CHANGE
10% NO RESPONSE
5% 2 OR MORE POSITIONS
5% 3 OR MORE POSITIONS
5.66% REMAINED IN TEACHING

FIG. 12
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of ascertaining significant contributing factors which might have caused the graduate to leave science teaching. The data are interesting if a comparison is made between the "no job holders" among the graduates in the group which left teaching and the "no job holders" among the graduates in the group which remained in teaching. Of the group which remained in teaching, 38.7 per cent held no jobs while employed in teaching. The graduates in the group which left teaching indicated 60.71 per cent held no jobs while teaching. The "no responses" would not affect these figures appreciably.

Figure 13 shows the percentage of the entire group who taught who held nonteaching jobs. The job categories range from "no jobs held" to "three jobs held." By examining the figure some insight may be gained into the percentage of graduates in the group who sought financial assistance beyond the income received from teaching. If the percentages from the "no responses" and the "no jobs held" categories are subtracted from 100 per cent, the portion of the group seeking additional income is found to be 28.34 per cent.

**Summer Employment: Effect upon Professional Improvement**

Figure 14 deals with summer employment only; 36.67 per cent of the 60 graduates who taught held no summer jobs.
NON-TEACHING JOBS HELD BY GRADUATES WHILE UNDER TEACHING CONTRACT

43.33% HELD NO OTHER POSITIONS

16.67% HELD ONE NON-TEACHING POSITION

26.66% NO RESPONSE

5% HELD THREE JOBS

1.67% HELD FOUR OR MORE JOBS

FIG. 19
DIFFERENT SUMMER JOBS HELD BY GRADUATES DURING PERIODS OF FULL-TIME TEACHING EMPLOYMENT

- 36.67% held no summer jobs
- 20% held one summer job
- 11.67% held two summer jobs
- 6.67% held three summer jobs
- 3.33% held four summer jobs
- 8.33% held five summer jobs
- 13.33% no response

FIG. 14
One interesting analysis of the data indicated in Figure 14 is a comparison among those graduates who remained in teaching and held a summer job and those from the same group who held no job but who attended school for additional summer courses. One hundred per cent of the respondents in this group who remained in teaching (31 cases) took additional work after receiving the Bachelor's degree. Ninety-three per cent of those who responded who held no summer jobs, took additional work. It should be noted that the number of respondents providing these data involved only 14 out of 31 cases, a fact which minimizes the importance of these data in relation to quality of position of the graduate.

**Group C: The Analysis of the Teaching Position**

Certain data were obtained regarding the amount of teaching done outside of the graduate's major and/or minor areas of preparation in order to determine any relationship which may exist between the effects of teaching outside of the major area of preparation and the persistence with which the graduates remained in teaching. Figure 15 indicates that 20 per cent of the group who taught (60 respondents) taught in one or more subjects outside of the major and/or minor areas of preparation. Of the group which left teaching (29 graduates) 41.38 per cent taught one or more subjects outside of the major and/or minor
NUMBER OF DIFFERENT SUBJECTS TAUGHT OUTSIDE OF THE MAJOR AND/OR MINOR AREAS BY THE GRADUATE

11.6% TWO OR MORE

3.33% THREE OR MORE

5.08% FOUR OR MORE

20% ONE OR MORE

6.66% NO RESPONSE

53.33% NO TEACHING OUTSIDE MAJOR OR MINOR

FIG. 15
areas. This figure becomes important when it is compared with the 41.94 per cent who taught outside the major and/or minor areas from the group which remained in teaching. The latter figures do not appear in Figure 14. The importance of the slight differences between the two percentages is accentuated if the "no responses" are considered.

The Method of Correcting for the "No Responses"

At this point it becomes necessary to explain the method used to determine the effect which the "no responses" would have on the percentages representing the data under the analysis of the teaching position. The "no response correction method" is used throughout the chapter to stress the effect which the "no responses" would have on the direction which may be indicated by the data concerning the various items in the questionnaire. The data to which reference is made were collected from the reactions received on the various items in the questionnaire. The "no responses" refer to the respondents who did not react to the questionnaire items. This method involves multiplying the "no responses" by the percentage expression of data representing the categories in which only responses were

---

5The assumption was made that the "no responses" could not be used alone either to make inferences or draw conclusions. The data excluding the "no responses" are used for this purpose, but the "no responses" are used to support the direction indicated by the original data.
included, adding the results of multiplication to the original number of reactions which excluded the "no responses" for a specific item, and then dividing this sum by the total number of graduates who responded to the questionnaire to obtain a corrected percentage expression. Thus, to obtain the corrected values for the percentage of graduates who left teaching who taught outside their major or minor areas of preparation, the method would be used as follows: 12 = number who taught outside the major 41.38 per cent (29 cases) of group who left; 2 = the "no responses"; 41.38 per cent x 2 = 1, the number to be added to the original 12; 12+1 = 13, the corrected figure for those who taught outside the major; 13 divided by 29, the total number in group, = 44.82 per cent, the corrected percentage expression of the graduates who left teaching, who taught outside the major and/or minor area. By applying the "no response correction method" to the percentage expression, 41.94 per cent (31 cases), for the group who remained in teaching, the corrected percentage figure becomes 48.39 per cent. The fact may be noted that the "no responses" which were assumed to answer in the same pattern as the responses were included in the comparison of the two groups represented by the figures 44.82 and 48.39. The result of the two comparisons (44.82 to 48.39 and 41.38 to 41.94) is similar but the comparative ratios in the two
sets of figures are different. This is due to the greater number of "no responses" to the data from the group which left.

**Persistence of the Graduate in Remaining in Teaching**

In order to obtain specific information relating to the persistence with which the graduate remained in a science teaching position, data were obtained for graduates and expressed for varying periods of time spent in teaching. Figure 16 indicates that the greater percentage of the graduates who left teaching left after a time interval of one year or less.

The data also indicate that after the first year, the percentages for the group are approximately equally distributed among the time interval periods ranging from three to six years. The absence of representative cases at the four- to five-year interval is probably due to the low number of cases in the group (29) who left teaching. The "no responses" comprised 13.80 per cent of the latter group. These "no responses" might have furnished cases in this category if responses had been received.

Although no verified figure was obtained for the average length of time spent in teaching by the graduate from the group which remained in teaching, an approximate figure of five years was obtained from other related data.
THE NUMBER OF TEACHERS LEAVING FOR OTHER JOBS AFTER VARYING TIME INTERVALS

NUMBER OF YRS.

1 OR PART OF YEAR 27.58%

2-3 YEARS 13.80%

3-4 YEARS 13.80%

4-5 YEARS 13.80%

5-6 YEARS 13.80%

6-7 YEARS 10.83%

7-8 YEARS 6.89%

NO RESPONSE 13.80%

% OF THOSE WHO LEFT TEACHING

FIG. 16
The data used to obtain this figure and the manner in which they were derived have been explained earlier in this chapter (page 75). However, the use of an approximated figure of five years indicates that its usefulness is questionable as a factor affecting the quality of position attainment by the graduate.

**Attainment of Position Desired**

Figure 17 indicates a relationship between the attainment of a desired teaching position and the period of time which had elapsed until the position was secured. These data were sought in order to determine any significant factor that contributed to the graduate's leaving science teaching. The diagram indicates that 25 per cent of the graduates in the group which taught (60 graduates) never obtained the kind of position which they wanted most. When the group which left teaching was compared with the group that remained in teaching, 27.58 per cent of the former group were found in the category with those graduates who admitted "never having obtained the position they desired." Twenty-two and fifty-eight hundredths per cent of the group which remained in teaching were found in this category. When the "no response" correction is applied to these percentages, the group which left teaching shows a figure of 31.38 per cent and the group which remained in teaching a figure of 23.03 per cent. Figure 17 also indicates that