THE FIELD TRIP IN THE TEACHING OF
HIGH SCHOOL EARTH SCIENCE

A Field Report
Presented to
The Graduate Division
Drake University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science in Education

by
William Clark Bertelson
August 1968
THE FIELD TRIP IN THE TEACHING OF
HIGH SCHOOL EARTH SCIENCE

by

William Clark Bertelson

Approved by Committee:

[Signatures]

S. de L. Campbell
Dean of the Graduate Division

265074
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>The problem</td>
<td>2</td>
</tr>
<tr>
<td>The procedure</td>
<td>3</td>
</tr>
<tr>
<td>Need for study</td>
<td>4</td>
</tr>
<tr>
<td>Limitations</td>
<td>5</td>
</tr>
<tr>
<td>II. THE QUESTIONNAIRE AND INTERVIEWS</td>
<td>6</td>
</tr>
<tr>
<td>Introduction</td>
<td>6</td>
</tr>
<tr>
<td>The Questionnaire</td>
<td>7</td>
</tr>
<tr>
<td>Tabulations and analysis</td>
<td>8</td>
</tr>
<tr>
<td>Summary of data from questionnaire</td>
<td>12</td>
</tr>
<tr>
<td>Conclusions from questionnaire</td>
<td>16</td>
</tr>
<tr>
<td>Interviews with Earth Science Teachers</td>
<td>19</td>
</tr>
<tr>
<td>III. ANALYSIS OF PUBLISHED MATERIALS ON FIELD TRIPS</td>
<td>25</td>
</tr>
<tr>
<td>Introduction</td>
<td>25</td>
</tr>
<tr>
<td>High school curriculum</td>
<td>25</td>
</tr>
<tr>
<td>Field trips</td>
<td>29</td>
</tr>
<tr>
<td>Field trip problems</td>
<td>30</td>
</tr>
<tr>
<td>Summary and conclusions</td>
<td>35</td>
</tr>
<tr>
<td>IV. A FIELD TRIP GUIDE FOR EARTH SCIENCE TEACHERS</td>
<td>37</td>
</tr>
<tr>
<td>Purpose</td>
<td>37</td>
</tr>
<tr>
<td>Introduction</td>
<td>39</td>
</tr>
</tbody>
</table>
THE FIELD TRIP IN THE TEACHING OF
HIGH SCHOOL EARTH SCIENCE

by

William Clark Bertelson

Approved by Committee:

[Signatures]

Dean of the Graduate Division
CHAPTER

Field Trip Organization ........................................... 41
Taking the Field Trip ............................................. 48
Field Trip Locations ............................................... 54
Summary and Suggestions ........................................ 60
Acknowledgment .................................................... 62

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS ........ 64
The problem ......................................................... 64
The procedure ....................................................... 64
Summary .............................................................. 65
Conclusions ......................................................... 68
Recommendations ................................................... 70

BIBLIOGRAPHY ....................................................... 71
APPENDIX A. Letter to Iowa High School Earth Science
   Teachers ............................................................ 74
APPENDIX B. The Questionnaire ..................................... 75
APPENDIX C. The Services Available Pertaining to
   Field Trips from Governmental Agencies ........................ 77
# LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Grade Level Where Earth Science Is Offered in Selected Iowa High Schools, Class Enrollment and Required Status of Course, 1966-67</td>
<td>9</td>
</tr>
<tr>
<td>II. Frequency of Earth Science Field Trips, Number of Trip Locations and Required Status of Course in Selected Iowa High Schools, 1966-67</td>
<td>11</td>
</tr>
<tr>
<td>III. Frequency of Earth Science Field Trips, Values of Teachers toward Field Trips, Reasons for not Taking Field Trips, and Desire for Guide, in Selected Iowa High Schools, 1966-67</td>
<td>13</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

With the development of new high school courses in Science for the upper three grades (PSSC Physics, CHEMS Chemistry, BSCS Biology, et cetera), it is not surprising that new courses of study are now being developed and introduced at the ninth grade level. One of these new courses of study now being introduced at the ninth grade level is Earth Science.

Earth Science as defined by the "Earth Science Curriculum Project (ESCP)" is a modern junior high school science course (eighth or ninth grade) to investigate the earth. Earth Science is an experience centered course in which basic principles and concepts are applied to developing an understanding of the how and why of natural phenomena. That is how the earth science disciplines of Astronomy, Geology, Geophysics, Meteorology, Oceanography, and Physical Geography have contributed to an understanding of man's environment. In general, all Earth Science courses of study such as the "Teaching Resources Development Program in the Geological Sciences (Duluth Conference)"; "Monograph Series in Meteorology"; "Manual of Lecture Demonstrations by Pennsylvania State University";
and the many textbooks by the leading publishers have very nearly the same objectives as the "Earth Science Curriculum Project." ¹

All of the new courses in Earth Science stress the importance of laboratory experience, and all of the new courses have laboratory guides that suggest many experiments that can be done in the classroom. In addition to the classroom experiments, films, and other teaching aids, there is an overwhelming need to get outside and observe the world around us. As John Hay, Director of the Cape Cod Museum of Natural History, has stated:

There are many ways which a child can learn, but when the subject is the World around him, the most valuable and lasting way is for him to experience that World firsthand. That is to touch, to smell, to look, to hear, preferably under the guidance of a knowing adult. ²

The problem. The purpose of this study was to determine the extent that Iowa High School Earth Science Teachers utilize field trips and to determine the significance of field trips to them. An additional purpose and the most

¹Chalmer J. Hoy, "Earth Science Curriculum Project (ESCP)," Course and Curriculum Improvement Projects, National Science Foundation, NSF 66-22, (September, 1966), pp. 11-12.

important reason for this study was to determine the best procedures that Earth Science teachers can follow in developing and executing field trips. This information was then compiled and used in the creation of a field trip guide. This guide can be used by Earth Science teachers in organization and execution of Earth Science field trips.

The procedure. One source of data for this study was the replies to questionnaires sent to high school Earth Science teachers of approved Iowa High School Districts.

The Iowa Educational Directory supplied the names of seventy-five Iowa high school Earth Science instructors. These names were placed into a container and fifty names were drawn at random. These fifty high school Earth Science teachers were sent the questionnaire.

Validation of the questionnaire was obtained by having the Hampton High School principal and two high school science teachers read the questionnaire. These three persons who read the questionnaire stated that they "understood the questions asked in the questionnaire."

The mailing, December 1966, brought responses to forty-four questionnaires, a response of 88 per cent in three weeks. Two of the fifty questionnaires were returned unopened, marked "address unknown." The actual returns then represented 92 per cent of those received by Earth Science teachers.
The data gathered from the responses to the questionnaires were compiled and examined. The method used in compiling and examining the data is as follows:

1. **Tabulation**: Counting the number of responses to the questions and sorting into categories.

2. **Tables**: Construction of tables to illustrate the data gathered from the responses.

3. **Percentages**: Calculating the percentages of certain responses in their categories.

4. **Analysis**: Determining the significance of the tabulated data.

The questionnaire data were primarily used in solving part one of the problem.

Another source of data for this study was the information obtained from the study and analysis of published periodicals obtained from libraries. These data were primarily used in solving part two of the problem. The analysis of the periodicals, certain answers to the questionnaire and direct responses by earth science teachers were used to gather additional data. These data were used to develop a guide which can be used by Earth Science teachers to help them organize Earth Science field trips.

Need for study. As a result of three years' experience in the teaching of ninth grade Earth Science, the investigator became aware of the problems involved in
setting up field trips. The obvious question was asked: Are these problems unique to the investigator or are they common to all Earth Science teachers? The reason then for conducting this survey was to find answers to teaching problems encountered by the surveyor.

Limitations. This study is largely based on the data compiled by questionnaires sent to high school Earth Science teachers. The study does not include any information from Earth Science teachers of grades seven and eight. In order to obtain a complete list of Earth Science teachers, grades seven through twelve, it was necessary to use the Iowa Educational Information Center in Iowa City. The services of the Iowa Educational Information Center were not possible to use, so a list of high school Earth Science teachers was compiled from the Iowa Educational Directory, published by the State Department of Public Instruction. This list only contained names of Earth Science teachers grades nine through twelve.

Another difficulty encountered by the investigation was the lack of published material pertaining to Earth Science field trips. Because of this shortage of published material, it was necessary for the investigator to rely heavily on information obtained through correspondence and interviews with Earth Science teachers in Iowa. This information was then used in developing a field trip guide for Earth Science teachers.
CHAPTER II

THE QUESTIONNAIRE AND INTERVIEWS

I. INTRODUCTION

The purpose of this chapter is to report the findings of the questionnaire sent to fifty Iowa high school Earth Science teachers, and to report the information obtained from interviews with Earth Science teachers. These findings and information will in part answer the following questions:

1. How many Earth Science teachers utilize field trips?
2. What value do Earth Science teachers place on field trips?
3. What are the reasons Earth Science teachers do not take more field trips?
4. Is there a relationship between the frequency of Earth Science field trips and the size of high schools?
5. Is there a relationship between the frequency of Earth Science field trips and the size of class enrollment?
6. Is there a relationship between the frequency of Earth Science field trips and the value placed on field trips by the teachers?
7. Is there a need for a field trip guide to help Earth Science teachers organize field trips?

The answers to the listed questions mainly resulted from a statistical analysis of the tabulated answers from the forty-four questionnaires that were returned. In addition to the information obtained from the returned questionnaire, personal interviews and direct correspondences with Earth Science teachers were used to further answer the listed questions.

The results of the analysis of the questionnaire are further supported by the use of information obtained from published articles in various periodicals. This is pointed out in Chapter III.

It is a further purpose of this chapter to show evidence of a need by Earth Science teachers for a guide to help them to organize field trips. The questionnaire and personal interviews provide evidence of this need.

The Questionnaire

The Iowa Education Directory supplied the names of seventy-five Iowa high school Earth Science teachers. These names were placed into a container and fifty names were drawn. Within three weeks of the mailing of the questionnaire, December 1966, forty-four responses were received. The forty-four responses represented an 88 per cent return.¹

¹Refer to Appendices A and B - Letter sent to Iowa Earth Science teachers and the Questionnaire.
Tabulations and analysis. The data gathered from the returned questionnaires were tabulated and then analyzed. The following tables illustrate the data gathered and tabulated from the returned questionnaires.

Table I shows that a majority of the schools surveyed (68 per cent) offered Earth Science at the ninth grade level. The table also points out that 59 per cent (twenty-seven) of the schools surveyed required the Earth Science course. The schools having the smallest school enrollment (0-50) and the schools having the largest school enrollment (over 150) represented the greatest percentages of required courses.

Table I shows that 60 per cent (twenty-eight) of the schools surveyed, the average class size was from 21-30 students. The table also points out that the schools having the larger school enrollments are more likely to have a larger average class size.

Table II shows that the number of field trips taken yearly by Earth Science classes does not seem to be affected by the fact the course is required or elective, nor does the grade level at which the Earth Science course is offered affect the frequency of field trips. The table also shows that only two schools of the eighteen that did not take field trips did not know of field trip locations. This small number can not be considered important. The only relationship shown in Table II is between frequency of field trips and student enrollment. Of the forty-two
TABLE I

GRADE LEVEL WHERE EARTH SCIENCE IS OFFERED IN SELECTED IOWA HIGH SCHOOLS,
CLASS ENROLLMENT AND REQUIRED STATUS OF COURSE, 1966-67

<table>
<thead>
<tr>
<th>Number of Schools Responding to Questionnaire</th>
<th>Earth Science</th>
<th>Required Class</th>
<th>Elective Class</th>
<th>Grade Level That Earth Science Is Offered</th>
<th>Average Class Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9 10 11 12 other:*</td>
<td>0-10</td>
</tr>
<tr>
<td>25</td>
<td>0-50</td>
<td>15</td>
<td>10</td>
<td>15 4 2 2 2 0 12 13 0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>51-100</td>
<td>5</td>
<td>5</td>
<td>7 1 0 0 2 0 1 7 2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>101-150</td>
<td>2</td>
<td>2</td>
<td>4 0 0 0 0 0 0 4 0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>151-up</td>
<td>5</td>
<td>0</td>
<td>4 0 0 0 1 0 0 4 1</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>TOTALS</td>
<td>27</td>
<td>17</td>
<td>30 5 2 2 5 0 13 28 3</td>
<td></td>
</tr>
</tbody>
</table>

*The term "other" means the course was offered as an elective course and could be taken by students at any grade level 9-12.
schools that take four or less field trips a year, twenty-two of them have from 1-50 students enrolled in Earth Science. One could conclude from this then that the more students enrolled in earth science, the more likely the teachers will take them on field trips. This statement seems to be somewhat in contradiction with Table III which points out that 18 per cent of the Earth Science teachers indicated the reason they do not take more field trips is because their class enrollment is too large. A possible explanation for this contradiction may be in the training of the teachers.

According to a report put out by the Iowa State Department of Public Instruction, the medium and larger school systems in Iowa have better trained Earth Science teachers.¹ This report also points out that the large schools take slightly more field trips and excursions than small schools. This report, however, includes all types of excursions, not just Earth Science.²

Table III shows several important factors. Probably the most important and also the most alarming fact is that 41 per cent of the Earth Science teachers surveyed took no


²Ibid., p. 47, Table D-9.
**TABLE II**

**FREQUENCY OF EARTH SCIENCE FIELD TRIPS, NUMBER OF TRIP LOCATIONS AND REQUIRED STATUS OF COURSE IN SELECTED IOWA HIGH SCHOOLS, 1966-67**

<table>
<thead>
<tr>
<th>Number of Schools Answering Questionnaire</th>
<th>Number of Yearly Field Trips</th>
<th>This Course Is:</th>
<th>Number of Locations Available for Field Trips</th>
<th>How Many Students Enrolled in Earth Science</th>
<th>What Grade Level Is Earth Science Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>None</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>1-4</td>
<td>17</td>
<td>7</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>5-10</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>11 or more</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>27</td>
<td>17</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>5</td>
</tr>
</tbody>
</table>

*The letter "A" means the course is offered as an elective course and can be taken by any student at Grades 9-12.*
field trips in Earth Science and 36 per cent of the Earth Science teachers surveyed felt that field trips have little or no value in the Earth Science course of study. Another factor pointed out in Table III is that even though 95 per cent of the Earth Science teachers surveyed took only from 0-4 field trips a year, 64 per cent felt that field trips had value in the course of study. In response to the question, "Why do you not take more field trips?", 48 per cent of the teachers responded that they did not have enough time, 20 per cent said they did not have enough college training, 18 per cent responded that their classes were too large, 7 per cent said they could not get administration approval, and 7 per cent responded that there were not adequate locations for field trips.

Summary of data from questionnaire. The questionnaire response can be summarized as follows:

1. That in 60 per cent (twenty-eight) of the schools surveyed, the average Earth Science class size was from 21-30 students.

2. That in 59 per cent (twenty-seven) of the schools surveyed, Earth Science was required in the high school.

3. That 68 per cent (thirty) of the schools offered Earth Science at the ninth grade level.
### Table III

**Frequency of Earth Science Field Trips, Values of Teachers toward Field Trips, Reasons for Not Taking Field Trips, and Desire for Guide, in Selected Iowa High Schools, 1966-67**

<table>
<thead>
<tr>
<th>Number of Schools Answering Questionnaire</th>
<th>Number of Yearly Field Trips</th>
<th>The Value Given to Field Trips by Earth Science Teachers</th>
<th>Reasons Teachers: Do Not Take More Field Trips</th>
<th>Desire For A Field Trip Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>None</td>
<td>8 3 1 6</td>
<td>8 1 3 4 2</td>
<td>3 7 8</td>
</tr>
<tr>
<td>24</td>
<td>1-4</td>
<td>1 4 15 4</td>
<td>11 2 0 5 6</td>
<td>8 6 10</td>
</tr>
<tr>
<td>1</td>
<td>5-10</td>
<td>0 0 1 0</td>
<td>1 0 0 0 0</td>
<td>0 0 1</td>
</tr>
<tr>
<td>1</td>
<td>11-up</td>
<td>0 0 0 1</td>
<td>1 0 0 0 0</td>
<td>0 1 0</td>
</tr>
<tr>
<td><strong>44</strong></td>
<td><strong>TOTALS</strong></td>
<td><strong>9 7 17 11 21 3 3 9 8</strong></td>
<td></td>
<td><strong>11 14 19</strong></td>
</tr>
</tbody>
</table>

**Note:** Definitions: Reasons for not taking more field trips:

A. Lack of time.
B. Lack of locations.
C. Administration disapproval.
D. Lack of college training.
E. Class size too large.
4. That 41 per cent (eighteen) of the schools took no Earth Science field trips during the school year.

5. That 54 per cent (twenty-four) of the schools took four or fewer field trips during the school year.

6. That 36 per cent (sixteen) of the schools felt that field trips have no or little value, whereas 64 per cent (twenty-eight) of schools felt that field trips had some or great value.

a. That 62 per cent (twenty-six) of the schools that had from 0-4 field trips a year felt that field trips have some or great value.

7. The reasons Earth Science teachers did not take more field trips were reported in order of frequency as:

   - Lack of time: 48 per cent
   - Lack of training: 20 per cent
   - Classes too large: 18 per cent
   - Lack of administration approval: 7 per cent
   - Lack of adequate locations for field trips: 7 per cent

8. To the question, "Would you take more Earth Science field trips if a guide were available to help you organize field trips?"
25 per cent of the responses said "no."

32 per cent of the responses said "maybe."

43 per cent of the responses said "very definitely would."

9. That 50 per cent of the Earth Science teachers that said Earth Science field trips have great value also said that they very definitely would take more field trips if a guide were available to help them organize field trips.

10. That 44 per cent of the Earth Science teachers that took no field trips would have taken more if they had a guide available to them for organizing field trips.

11. That 50 per cent of the Earth Science teachers that thought field trips had some or great value did not take more field trips because of lack of time.

12. That 78 per cent of the Earth Science teachers who said they did not have adequate college training for field trips, also said that they very definitely would take more field trips if a guide were available to help them organize field trips.

13. That 43 per cent of the Earth Science teachers who said they did not have enough time to take more field trips also said they very definitely would
take more field trips if a guide were available to help them organize field trips.

14. To the question, "Would you take more field trips if a guide were available that would point out locations in your area for Earth Science field trips?", the response was:

   a. No 32 per cent
   b. Maybe 27 per cent
   c. Very definitely would 41 per cent

Conclusions from questionnaire. The following conclusions are justified on the basis of the data compiled from the responses to the questionnaire.

1. Most Iowa high school Earth Science teachers took their Earth Science students on few or no field trips.

2. Even though most Iowa high school Earth Science teachers took their Earth Science students on few or no field trips, they felt that field trips are important in Earth Science and they would like to take more.

3. The main reasons that Earth Science teachers did not take field trips were lack of time and college training.

4. Iowa Earth Science teachers would have taken more field trips if they had a guide to help in the
organization of field trips and point out locations.

The questionnaire showed 41 per cent of Iowa high school Earth Science teachers did not take field trips and 55 per cent took fewer than five field trips a year. Sixty-four per cent of the responses indicated that field trips in Earth Science had some to great value. The data from the questionnaire also pointed out that 48 per cent of the Earth Science teachers did not take field trips because of lack of time and 20 per cent thought lack of college training the main reason for not taking field trips. Forty-three per cent of the Earth Science teachers responding to the questionnaire felt that they very definitely would take more field trips if a guide were available to help them organize field trips and 41 per cent of the responding Earth Science teachers also said that they would very definitely take more field trips if a guide were available to point out field trip locations.

Lack of college training represented 20 per cent of the responses to the question, "Why don't you take more field trips?". Twenty per cent in itself does not seem significant, but there is more than one way of evaluating this percentage. This summer (1967), the National Science Foundation is sponsoring sixty Institutes across the United States to provide training for Earth Science teachers.¹

Why is such a large amount of money being allotted to Earth Science teachers? The answer is obvious. There are many poorly prepared Earth Science teachers in Iowa and the Nation. For example, most Earth Science teachers in Iowa would fall short of meeting the requirements of the North Central Association of schools. The minimum requirement of the North Central Association of schools is ten semester hours of Earth Science.\(^1\) According to the Iowa State Department of Public Instruction, of the schools surveyed by them, 88 per cent of the instructors teaching Earth Science had eight or fewer semester hours of training in Earth Science.\(^2\) If this report is accurate then, the 20 per cent who responded to the questionnaire are not only honest, but must really need additional college training. It is likely then that many of the 80 per cent who did not indicate need for additional training really do need more training, but felt this was not their main reason for not taking more field trips.

In Chapter I, the investigator indicated the reason for doing this investigation was to solve problems relating

\(^{1}\)"Policies and Criteria," The North Central Association Quarterly, XXXVII (Summer, 1962), 147.

\(^{2}\)Porter and others, op. cit., p. 41, Table D-3.
to Earth Science field trips that had been encountered by
the investigator while teaching Earth Science. The ques­
tionnaire has shown that most Iowa high school Earth
Science teachers also have had difficulties with Earth
Science field trips. A partial solution to these problems
is the development of a field trip guide to help Earth
Science teachers plan and organize field trips.

Interviews with Earth Science Teachers

Additional information was obtained by direct
correspondence and personal interviews with ten high
school Earth Science teachers and one college instructor
of Earth Science. The college instructor had eight years
of previous experience as a high school Earth Science
instructor. The additional information was obtained for
two reasons: (1) to find out what some instructors of
Earth Science meant when they said they did not have enough
time for field trips, and (2) to obtain information for use
in the field trip guide.

Lack of time and lack of college training were the
two responses given most often to the question, "Why
don't you take more field trips?". What does lack of time
mean? All Iowa high schools operate on very similar time
schedules. Why then do 52 per cent of the Earth Science
teachers have adequate time and 48 per cent do not?
Obviously, lack of time has different meanings to different teachers. In an attempt to better evaluate what lack of time means to different teachers, interviews were conducted with several Earth Science teachers.

When an Earth Science teacher said he did not have enough time to take field trips, this usually meant one of two things. The most common explanation of lack of time refers to the forty to sixty minute class period. A large number of Earth Science teachers felt that the only time that they could take their students on field trips was during the school day. That is, if they were teaching four sections of Earth Science and each section consisted of a forty-five minute period of study, the Earth Science teacher took one group of students to a location and back to the school in this forty-five minute period of time. Naturally, when one considers time of travel to and from the location, this leaves almost no time for the investigation which should take place at the location. As Miss Dorothea B. Van Tiger of Tama, Toledo High School stated:

I have three classes in Earth Science and the greatest problem is getting time within the fifty-five minute class period. It is almost impossible to get a group to any location and return in this time.

Several other teachers stated almost the same thing. Larry Lee Peterson of George Community High School said:
I have found that the biggest difficulty with field trips is the time factor. That is the time it takes to orient the students, to get to the area, and the time it takes to follow up. If the school day and scheduling allowed for more time, I would very much like to use more field trips in Earth Science.

Donald H. Lange of Davenport stated: "During the school day, a trip is impossible. Travel time just out-of-town and back to the school would eat up the class period."

On the basis of these interviews, it would seem that a teacher must be selective in his choice of a field trip location. Some locations can be reached and investigated during the normal class period, while others can not. As Ken Moeller, of the Hampton Community School system stated:

There are several locations that can easily be investigated during the normal fifty-five minute period. These locations are simple in content and are only a few miles from the school. However, there are other locations that are broader in content or farther from the school that can not be investigated during the normal class period.

Stacey Hoviell of Middle, Iowa said, "Our high school is located on the valley wall of the Iowa River, so it is easy to take field trips during the class period."

The solution to the time problem of the field trip during the class period is quite simple. The Earth Science teacher must select locations that are simple in content and close to the school if he is going to take a field trip during the normal class period. If the location to
be investigated is complex or far from the school, then
the teacher must take a half day or all day field trip.
The solution is simple enough but to put it into practice
is an entirely different thing. It was stated earlier
that "lack of time" generally had two meanings to the
Earth Science teacher. The first dealt with the short
class period. The second deals with the half day or day
long field trip.

Most teachers who complained that the normal class
period was too short of a period of time for a field trip
thought that the day long or half day field trip would be
more than enough time. As Jerry Schliep, Earth Science
Instructor at Willmar State College of Minnesota, stated:

When you take students on a field trip there has
to be time for discovery and investigation. The
instructor should never just point out things of
interest. He is there as a guide and source of help
to the students, but the students themselves must be
apart of the investigation. If a field trip is just
an excursion to point out things of interest as you
drive by, the instructor should put it all on slides
and keep the students in the classroom.

It seems that the day long field trip ends up
creating more problems than it solves. As Jerry J. Ald-
rich of Alden Community Schools has stated: "Other teachers
get very unhappy if we take students from their classes. As
a result, sixty minute field trips are the maximum." So you
see a new problem has been created. How do you get the
students for an all day field trip when they must be
released from their other classes? This involves getting administration approval and this is not always easy either as Roy E. Jarrard of Waverly-Shellrock School System has stated:

We are required by our administration to make our field trips and return within our scheduled fifty-five minute period. I would say administrative disapproval is my biggest problem.

Another problem created by the all day field trip is the size of the group of students that takes the trip. When you take an all day field trip, this means that you will be taking all sections of Earth Science at one time. This could mean anywhere from fifty to one hundred and fifty students at one time. With a group this large, discipline and control become serious problems. The field trip is, of course, for the students to gain from first hand experience, but control and direction must be administered by the teacher. Mrs. Lysle Hansen of Swea City Community schools stated: "When I go on field trips, I must take both classes at once which makes forty-eight for me. This is too many."

What then is the solution to this dilemma? Are the 41 per cent of the Earth Science teachers that did not take any field trips correct? Is there some way out of this problem?

There is a solution to this problem, not an easy one, in fact one that requires some extra effort by the
Earth Science teacher. This extra effort required by the Earth Science teacher is in the area of organization and planning of the field trip. The solution to this problem and others that involve the organization of field trips is included in the handbook for Earth Science field trips that is presented in Chapter IV of this project.

Additional information obtained by personal interview and correspondence will be used in the Earth Science field trip Handbook. Some of the teachers that stated they had the problems dealing with time, scheduling, and class size have found solutions to these problems. These solutions will be included in the Earth Science field trip Handbook.
CHAPTER III

ANALYSIS OF PUBLISHED MATERIALS ON FIELD TRIPS

Introduction. In this chapter, the investigator will show that the high school science curriculum today is undergoing change. One of the changes taking place today in high school science curriculum is the replacement of general science with Earth Science. In this chapter, the reasons for replacing general science with Earth Science will be pointed out. Also, Chapter III shows that Earth Science is a course of study that must include field trips if it is to be taught correctly.

Another purpose of this chapter is to show the results of two related studies pertaining to field trips. In particular the information from these studies and other information will be used to show another reason why Earth Science teachers do not take their students on field trips.

High school curriculum. In this era of constantly changing school curriculum, there is mounting pressure to include more and more science. A look at the secondary school level reveals two definite changes taking place. Replacement of out-dated general science courses and an
increase in laboratory experience. The emphasis on the lab approach is no doubt the result of a desire on the part of educators to present science as something other than a compendium of facts and figures. Facts change overnight, they become absorbed in other facts as knowledge increases; some are proven false. Courses structured around telling about facts are miserably inadequate in conveying the fundamental ideas and concepts of science. The rejection of general science courses is usually related to three factors. Much of the material is of the factual nature, too much of this factual material has already been presented to the students many times at lower levels, and the subject matter is usually presented in units that bear little relation to one and other.\footnote{Willard Gates, "The Importance of Earth Science In the Curriculum," The Science Teacher, XXVIII, No. 3 (April, 1961), 22-25.}

The traditional high school science courses continue to be biology, chemistry, and physics. With these courses continuing to be a part of the high school science curriculum, what then should be added to take the place of general science? A new course should be something other than the basic three and yet show strong correlation to the basic three. Geology, Astronomy, and Meteorology are three possible courses that could be added to the curriculum. However, is there real justification for adding Geology,
Astronomy and Meteorology to an already overcrowded school program? As individual courses of study, none of the three could be a justified addition to the science curriculum. Yet there are a number of principles and concepts that are included in these courses of study that have great value. All of these courses involve studies dealing with the world that one lives on and the universe that one lives in. Ever since the first man became curious about the world that he lived on, he has been fascinated by the mysteries of how and why things have come to be. Should high school students be deprived of an experience that deals with these questions?

The answer to this question is shown in the large number of high schools that are now offering Earth Science in place of general science at the ninth grade level.

What is the content of the earth science course and what does it do for the student that the general science course did not do? Most courses of study in the Earth Sciences will include the units: The Earth's Beginning, the Earth's History, The Changing Earth, The Earth's Crust, The Earth's Wealth, History of Astronomy, the Tools of Astronomy, The Solar System, Beyond our Solar System, History of Meteorology, The Atmosphere, The Seasons, Weather Elements, Air Masses, Storms, Predicting Weather.¹

All of these units draw heavily upon Biology, Chemistry, and Physics. Earth Science becomes an excellent medium for demonstrating the interdependence of all the science fields. Some factual materials are of course presented to the students in this course, but a course in Earth Science is also dynamic and is a problem solving course.¹

A problem solving course is one that of course requires laboratory work. The best way to learn answers to problems is through discovery in the laboratory. Most of the principals pertaining to Physics, Chemistry, and Biology can be emphasized and discovered in the conventional high school laboratory with modest equipment. However, in an Earth Science course this is only partly true. As can be seen, when one studies Earth Science, one is studying the physical world around him and this is not only difficult to bring into the laboratory but often impossible. Therefore, it becomes necessary to bring the laboratory to the problem. That is to take Earth Science classes on field trips. In all of the sources of Earth Science curriculum studied, the need for laboratory field trips is emphasized.

In the special bulletin published by the National Science Foundation on Course and Curriculum Improvement Projects, September 1966, the importance of Earth Science

¹Gates, loc. cit.
field trips is pointed out. Likewise, the special bulletin published by the Science Curriculum Committee of the State of Iowa Department of Public Instruction (1966) suggests the use of field trips in most every unit of study in Earth Science. Bisque, ESCP Director stated: "Earth Science is an experience centered course of study and the field trip adds great potential to this scope of study."

Field trips. Field trips are nothing new. Every year thousands of high school classes take field trips. These field trips are a planned visit to points outside the regular classroom. Generally, its purposes are to develop appreciation and understanding of things as they really are and to secure information at its source, to bring school and community programs into closer relationship, and to begin a new lesson or unit or to culminate one. The following are some kinds of field trips made in the secondary school: Biology class - fish hatchery; Social Studies - State Hospital; Home Economics - Food Store; Drivers Training - garage; and Consumer Math - Bank.

The Earth Science field trip is similar in nature to the conventional field trip yet quite different. Many


of the objectives of the Earth Science field trip are the same as the conventional field trip, but there is one big exception. If many of the concepts and ideas presented in an Earth Science course of study are to be developed and understood, laboratory procedures of discovery must be experienced by the student. And when the subject of the student's study is the world around him, his laboratory for discovery becomes the Earth Science field trip.

The responses to the questionnaire sent to Iowa high school Earth Science teachers strongly indicate that Earth Science teachers are not using this very important laboratory experience "the field trip." The analysis to the questionnaire points out several reasons why Earth Science teachers are not taking more field trips. Perhaps there is still another reason.

Field trip problems. In April, 1964, a survey was conducted by the Minnesota Journal of Education. This journal is published by the Minnesota Education Association.

The Minnesota Journal of Education sent questionnaires to twenty elementary and twenty secondary principals in Minnesota schools to obtain an overview of how the field trip is used, planned, and what problems, if any, were created and/or encountered. Of the twenty-nine replies (nineteen secondary and ten elementary), twenty-eight
regularly use field trips, some to a much greater extent than others. The findings of this survey pointed out that conventional field trips for the most part have not been rewarding experiences for the teachers. The field trip has always created many problems for the teacher or supervisor of the trip. Some of these problems have been missing of classes, transportation, financing, adequate supervision for large groups, time schedules to keep, liability in case of accident, and probably the most disheartening problem: the confirmation that the trip had little or no educational value.  

Perhaps there is some carryover from these poor experiences with conventional field trips that cause the Earth Science teacher to shy away from field trips in Earth Science. The Earth Science teacher must realize that if he is going to teach Earth Science as it should be taught, field trips are a must. John Hay, Director of the Cape Cod Museum of Natural History summarizes this idea:

Rocks picked up are objects of wonder to a child. But if his questions about things in nature are consistently ignored, he may grow up with little interest in his surroundings. To answer and explain them at the moment of his inquiries is to introduce the earth's processes to a highly receptive mind.

---

1J. Otterness and others, loc. cit.
Curiosity so rewarded increases a child's understanding of himself as a part of a changing world.¹

This is not to say that all Earth Science trips are naturally successful field trips, far from it. Earth Science field trips can be just as bad as any other kind of field trip. For example: A field trip was described in the May 9, 1964, New Yorker. This was a geological field trip to Fort Tryon Park. This field trip could be used as an example of a poor field trip. This field trip began by the students' learning of it by reading a notice on the bulletin board, "Meet at 10:30 A.M. at Fort Tryon Park for a geology field trip." The next morning the group of geology students met at the park at the correct time and then proceeded to follow their instructor through the park. The instructor surely had much information to give to his students and many points of interest to show them, but only a few students, those that were very close to him obtained any of this information. The class had been unprepared beforehand for this excursion, therefore they had no idea what they might do or see on the field trip. When the trip was finished, the instructor made no attempt to summarize or explain the happenings of the morning and as a result of the instructor's lack of organization, most

of the group gained nothing from the field trip except some exercise.1

A field trip that could be classified as the direct opposite of the Fort Tryon Park geological jaunt is conducted yearly by Ivan L. Jirak, Earth Science teacher at Knoxville Junior High School, Pittsburgh, Pennsylvania. Jirak takes a group of seventy students and parents on an eight day, 2,200 mile field trip through the Appalachian Mountains and upper Great Lakes regions. Unconformities, erosional stages, diurnal differences, rock types, erosional force of water, mountain formations, outcroppings, cave formations, waterfalls, limestone mines, and ancient blast furnaces are just a few of the things investigated by the students on this trip. There is ample time allowed for each location studied and the instructor guides the students to making the desired discoveries.

Before the field trip starts, Jirak informs his students of the places they are to visit and the things they are to investigate at the various places. During the trip, there are many occasions when Jirak will conduct lectures on the Earth Science concepts or principles to be investigated at a particular location. When the eight day trip has been concluded, several days of follow-up are

---

conducted in the classroom. The students are also required to present oral and written reports of their experiences of the field trip.¹

This field trip conducted by Jirak for his Earth Science students certainly is an example of what an ideal field trip should be but most Earth Science teachers could never hope to be this fortunate. However, the number of miles covered, the number of days spent, and the number of locations studied does not constitute a good field trip. A good field trip results from sound advanced planning by the teacher. Planning of the trip itself and planning with students who will make the field trip will insure a favorable learning experience for the students.

Planning and organization are the most important factors to insure a successful field trip. These important factors were recognized by the Fairfax County Public Schools, Fairfax, Virginia. In 1962, the Fairfax School System conducted a project that resulted in the development of a field trip handbook. This handbook shows the teacher how to plan a field trip. Some of the information in this handbook is used in the field trip guide presented in Chapter IV. However, much of the information in this handbook does not apply to Earth Science field trips, since it was developed for conventional excursions, in particular

those in the area of the social sciences. It must be pointed out, however, that this handbook stresses the importance of teacher planning to insure worthwhile field trips.¹

Summary and conclusions. A change has taken place in the high school science curriculum. Earth Science has replaced the general science course that was offered at the ninth grade level. This change has taken place because of the mounting pressure to include more laboratory oriented science courses. Earth Science is the best replacement for general science since it is an excellent medium for demonstrating the interdependence of all the science fields. Earth Science draws heavily upon biology, chemistry, and physics, the continuing traditional high school science courses.

Earth Science is a dynamic problem solving course of study and, of course, a problem solving course requires laboratory work. An Earth Science course does not use the conventional science laboratory. Since Earth Science is the study of the physical world, it is impossible to bring the subject to the laboratory. Therefore, it becomes necessary to bring the laboratory to the problem. That is, it becomes necessary to take Earth Science classes on field trips.

Field trips are not always pleasant and rewarding experiences as pointed out by the studies of the Minnesota Journal of Education and Fairfax County Public Schools. However, a teacher can assure himself of a more successful field trip if good planning and organization are used.

The following conclusions are justified on the basis of the information acquired from the published materials presented in this chapter:

1. Earth Science is a course of study that requires a special type of laboratory experience (the Earth Science Field Trip).

2. Earth Science field trips are a form of a laboratory exercise that must be performed by Earth Science students if they are going to develop the desired understandings of the Earth.

3. Successful Earth Science field trips result from careful planning and organization.
CHAPTER IV

A FIELD TRIP GUIDE FOR EARTH SCIENCE TEACHERS

Purpose. The purpose of this investigation was to solve a two part problem. The first part of the problem was to determine the extent that Iowa high school Earth Science teachers utilize fields and to determine the significance of field trips to them. As pointed out in Chapter II, most Iowa Earth Science teachers take their Earth Science classes on no or few field trips. Chapter II also indicated that although most Iowa Earth Science teachers take their Earth Science classes on no or few field trips, they felt that field trips were an important part of the Earth Science course of study. In Chapter III, the results of other studies dealing with class excursions were pointed out. These results showed that most teachers have found field trips an unrewarding experience. The results from these studies also showed that an important reason for the failure of field trips was lack of planning.

The purpose of Chapter IV is to present a field trip guide that was developed by the investigator. The reason for this presentation is to provide a useful tool for Earth Science teachers to help them plan and organize
Earth Science field trips. The development and presentation of the Earth Science field trip guide fulfills part two of the problems of this investigation, as contained in the following pages:
I. INTRODUCTION

Earth Science is a course of study that deals with the concepts and ideas of the physical world that the student lives in. It is a course of study that must introduce to the student the earth's processes as to increase the student's understandings of himself as a part of a changing world. An Earth Science course of study is more than a presentation of factual knowledge in the areas of Geology, Meteorology, and Astronomy, it is an experience centered course of study. The student of Earth Science must learn many of the concepts and ideas of the physical world through laboratory discoveries.

Some of the principles and concepts in Earth Science can be emphasized and discovered through conventional laboratory procedures in the classroom. However, some concepts and ideas can not be emphasized in the classroom laboratory, for you see, when you are studying Earth Science you study the world around you and this is not only difficult to bring into the classroom but often impossible. Therefore, it becomes necessary to bring the laboratory to the problem. That is, it becomes necessary to take Earth Science classes on field trips.
As many Earth Science teachers have learned through experience to take field trips is a lot easier said than done. To insure some degree of success when taking students on Earth Science field trips, a great deal of planning and organization must be done by the Earth Science teacher. It is hopeful that this guide will aid the Earth Science teacher in organization of Earth Science field trips.

A. Objectives of the Field Trip

The purpose of taking an Earth Science field trip should be to fulfill the educational needs of the students. It should never be just something that should be done because it seems to be a necessary part of an Earth Science course of study. That is the Earth Science teacher must recognize the field trip as a means for the student to experience and discover important concepts and ideas in Earth Science. Therefore, it becomes important for the teacher to prepare certain objectives that he wants to fulfill by taking a field trip. A given field trip will have specific objectives that will pertain to the ideas and concepts being studied at that time. These specific objectives should be organized by the Earth Science teacher at the time of the desired field trip. However,
there are some general objectives that apply to all field trips and these objectives should be recognized. The general objectives that should apply to all Earth Science field trips are:

1. To develop appreciation and understanding of things as they really are.

2. To secure information at its source.

3. To insure that the field trip is experience centered:
   a. Students will have the opportunity to investigate and make discoveries.
   b. Students will have the opportunity to ask questions and get answers.

4. To develop and guide the use of the scientific method.

5. To develop in the student an awareness of man's place in a changing physical world.

II. Field Trip Organization

This part of the guide is designed to point out the steps that an Earth Science teacher must take before the actual field trip is taken. The order of presentation of the steps does not represent the order that the Earth Science teacher must perform them. In fact, some teachers may feel that all of the steps of preparation are not necessary. In some school systems, it is
quite likely some of the planning steps can be eliminated.

A. Do I know the resources of the planned field trip site?

1. Have I determined that this location will be an effective teaching tool to fulfill the objectives of the trip?

2. Have I checked all local sources for teaching materials and aids pertaining to this location?

3. Have I visited this place and noted points of interest?

4. Have I made all necessary contacts for permission to visit this location?

A future location of a field trip should be as familiar to the Earth Science teacher as his own classroom. Because, of course, the location will become a classroom during the time of visitation. To become familiar with the field trip location, will require the Earth Science teacher to visit the site and explore it thoroughly to discover all of its potential. In some cases it will be necessary to mark points of special interest and perhaps even draw a map that will direct the students.
B. Have I developed a time schedule?

1. Have I allowed maximum time for travel to and from the location?

2. Have I allowed maximum time for all activities to be performed?

3. Have I allowed extra time for the unexpected (new questions or discoveries that might arise)?

Different locations will require different total amounts of time needed for the field trip. In many cases, the normal classroom period of fifty-five minutes or so will be sufficient. However, in other cases it may be necessary to use a half day or an entire day to take a particular field trip. In any case, the Earth Science teacher must have a well planned schedule with adequate time allotted to perform the functions of the field trip. It will be necessary sometimes to take the field trip on a weekend to have sufficient time.

C. Is there adequate adult supervision of the students during the field trip? If the students are going to experience the learning situation that is required of them, it is necessary to control the students and direct them. How many students one Earth Science
teacher can control and direct, of course, depends on the teacher. Some teachers have trouble maintaining discipline with ten students while others can easily handle fifty. Generally speaking, a teacher should be able to handle the number of students in one normal class section.

If the field trip is going to be conducted during the normal class period of fifty-five minutes or so, then the Earth Science teacher alone will be adequate to maintain control and direction. However, if the field trip is going to be a half-day or longer in time, so that more than one section of students will be making the trip, then it will be necessary to have additional adult supervision. Additional adult help can be obtained by soliciting other members of the science teaching staff, administrators, or people from the community who are interested and familiar with the location.

D. Is there administration approval for the field trip?

Administration approval and support is probably the most important step in the preparation of a field trip. This step is not as
obvious and simple as it may seem to be. Most administrators will readily approve field trips that will be conducted during the normal class period, but quite often turn thumbs down on the half-day or all day field trip. When the Earth Science teacher meets with the principal, he should be ready to do much more than ask for permission. The teacher must be prepared to do a selling job. If an administrator is convinced that the field trip is an intricate part of the Earth Science course of study and must be taken in order to achieve the objectives of the course, it is very unlikely that his approval will not be given. Most administrators feel that a field trip is like a military maneuver and must be carefully planned. Therefore, the Earth Science teacher must have most of the groundwork for the field trip finished when time comes for asking for administration approval. That is, the teacher must have plenty of ammunition on hand to do the job of selling.

When the administrator has given his approval for the field trip, invite him to come along
as a supervisor. If he accepts the invitation and goes on the field trip, this will then give the teacher additional opportunity to sell him on the importance of field trips. This, of course, will make future field trip approval easier to obtain.

In the event administration approval cannot be obtained for all day field trips during the school day, then it will become necessary for the Earth Science teacher to try to make arrangements for Saturday field trips. No one likes to denote their free time, but sometimes it becomes necessary if the teacher is going to do an effective job of teaching. There are very few administrators who would not think highly of a teacher who is willing to sacrifice in order to achieve their goals. If the Saturday field trips are successful, it is quite likely that the administration will be more willing in the future to give approval to all day field trips during school time.

E. Has arrangement for transportation been made?

1. Are there adequate number of buses for the number of students taking the field trip?
2. Have the bus drivers been given a copy of the time schedule?

F. Have I checked all school board policies governing field trips?

1. Does the school carry liability insurance for teachers on field trips?

2. Does the school carry insurance to cover injury to both teacher and student?

Some insurance policies do not provide coverage of students or teachers while on field trips. The policies may provide coverage for passengers on a school bus, but when the student leaves the bus the coverage may stop. Accidents can happen to students on field trips no matter how careful the teacher and students may be to avoid them. In most cases the teacher is liable for the safety of the students. If the school does not provide liability insurance for the teacher, it would be a wise idea for the teacher to provide his own insurance.

G. Have "permit slips" allowing the student to participate in the field trip been turned in by each student?

Permit slips from the parents allowing the student to participate in the field trip should be required of all students. If
possible, these slips should waive liability of the school and teacher and must be signed by the parents. These slips must be on file in the administrator's office before the trip is taken. If private cars are used rather than school buses, the school district's insurance should include a rider which covers private cars used for this purpose. Also "permit slips" should be used to cover the use of private cars.

H. Is a first aid kit available for use on field trips?
Minor injuries are common on field trips. A first aid kit should be present on field trips to take care of cuts, scratches, et cetera.

III. Taking the Field Trip

The field trip consists of three parts: a student discussion period for student preparation, the trip itself, and a second discussion period to summarize and evaluate what was learned.

A. Student preparation

The students must be well prepared for the field trip. The Earth Science teacher should keep in mind that an Earth Science field trip is more than an excursion to look at points of
interest. An Earth Science field trip is a laboratory exercise to discover answers to questions that have resulted from the classroom study of Earth Science concepts and ideas. Keeping in mind that the Earth Science field trip is a laboratory and student centered experience, the Earth Science teacher should prepare a field trip guide for the students. The guide for the field trip should include a general description of the location that will be visited. This description should include a map of the area with points of investigation clearly marked. In addition to the description of the location of the field trip to be taken, the guide should include a summary of the purpose for the field trip. The concepts and ideas that will be reinforced by the field trip should be included in this summary. The next section of the guide should be a series of questions to be answered by the students. The Earth Science teacher should try to make the questions of the type that the student must do some investigation while on the field trip in order to answer the questions. The problem of student control and supervision can be somewhat simplified at this time. If one adult supervisor is available for each
thirty students, the group of thirty students can best be handled in the following way:

When the Earth Science teacher constructs the student field trip guide, he should have at least five points of investigation at the location. These five points of investigation should be clearly marked and numbered at the location. The questions in the student field trip guide, that are to be answered by the students, should be grouped according to the five points of investigation. The groups of thirty supervised students can then be divided into five groups of six students. Each group of six students will have a leader, preferably a reliable student and each group will be given a number. The number could be "A-1," where "A" stands for the supervisor in charge and "1" represents the group of six students. In the student field trip guide a time schedule and sequential directions should be outlined for each group. For example the sequential directions and time schedule for group "A-1" could be:

Directions for Group A-1

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00-9:10</td>
<td>Investigate site No. 1</td>
</tr>
<tr>
<td>9:10-9:20</td>
<td>Investigate site No. 2</td>
</tr>
<tr>
<td>9:20-9:30</td>
<td>Investigate site No. 3</td>
</tr>
<tr>
<td>9:30-9:40</td>
<td>Investigate site No. 4</td>
</tr>
<tr>
<td>9:40-9:50</td>
<td>Investigate site No. 5</td>
</tr>
</tbody>
</table>
If the time schedule is well constructed, so that the students must keep busy in order to finish their investigations, the number of disciplinary problems will be at a minimum. The day before the field trip is to be taken, carefully go over the student field trip guide so that all students understand exactly what is expected of them. Since the Earth Science field trip is really a laboratory experience, the students should be required to hand in a written report of the exercise. This report, of course, should not be just a description of what they have seen, but should also include their answers to the questions in the student field trip guide. In some cases to tell the students that they will have a test covering the information that will be obtained on the field trip will motivate them to do a better job.

It is also important that you inform the students that although the field trip is planned as a learning experience for the pupil, it should also be remembered that it also will be a learning experience for the community. Any adults in charge of the location to be visited will receive definite impressions of the intelligence, manners, and behavior of the
students and thus the entire school system.

B. The Field Trip Itself

If the Earth Science teacher has followed the practice of sound advanced planning, the field trip will be a wonderful learning experience for the student and a favorable experience for the Earth Science teacher.

There are two points that the Earth Science teacher must keep in mind while on the field trip. First, the Earth Science teacher's primary function is to be a guide and source of help for the investigating student. Secondly, the Earth Science teacher should try to follow the schedule in the student field trip guide as close as possible.

One word of caution: The Earth Science teacher must be prepared for the unexpected. It is not uncommon for something to happen which will require on the spot adjustments to be made.

What are some of these unexpected things that might happen? Some things that might happen, but hopefully they will not are: the bus breaks down, a student gets sick, a sudden rainstorm, the bus fails to return to pick up the group, et cetera.
C. The Follow-up Period

The "follow-up period" is as important as the field trip itself. This part of the field trip should take place during the next regular class period. The follow-up is a time when the students should be allowed to discuss their investigations and ask any questions that still may be unanswered. It is very unlikely with a large group of students that the Earth Science teacher will be able to answer every student question that comes up during the field trip. It is, of course, very important that these questions are answered. Perhaps it would be a good idea to allow space in the student's field trip guide for student questions to be written down as the students think of these questions. The Earth Science teacher may want to allow class time for the students to finish the required written report of the field trip investigations. This is a good idea because the teacher then is at hand to direct and help the students. There is always a good possibility that student questions that may result from the field trip can be used as a
basis for special student library reports. Another possibility is that the student questions from the field trip investigations will be excellent lead-ins to begin a new unit of study.

IV. Field Trip Locations

Selection of quality field trip locations, of course, is a problem for the inexperienced Earth Science teacher. The number and type of field trip locations will vary from one school system to another. There is no set pattern that an Earth Science teacher should follow in a selection of a possible Earth Science field trip location. The teacher is going to have to inquire, explore, and investigate the area in which he lives to find possible locations. Here are some suggestions that may help in locating possible field trip sites:

A. Possible Sources of Field Trip Sites

1. Check on any mining operations in your area.
   a. limestone quarries
   b. clay quarries
   c. coal mines
   d. lead mines
   e. iron strip mines
   f. gypsum mines
2. Check with county extension offices.
   a. erosional features
   b. road cuts
   c. rock out crops
   d. conservation projects
   e. stream cuts

3. Check with Earth Science departments of colleges and universities near your school for suggestions.

4. Check with governmental agencies. *
   a. United States Geological Survey Offices
   b. State Department of Public Instruction, Des Moines, Iowa
   c. State Department of Agriculture, Des Moines, Iowa
   d. United States Weather Bureau, Des Moines, Iowa
   e. Iowa Geological Survey, Iowa City, Iowa

5. Check with college and university observatories.

6. Check on museums and planetariums.
   a. Iowa Historical and Geological Society Museum, Des Moines, Iowa

*Refer to Appendix C - Services Available from Governmental Agencies.
b. Sanford Museum and Planetarium, Cherokee, Iowa

c. Grout Historical Museum and Planetarium, Waterloo, Iowa

7. Check on State and National Parks.
   a. State Conservation Commission, Des Moines, Iowa

B. Example Locations

The above listed agencies, et cetera, are places where Earth Science teachers can obtain information about possible field trips. However, this will probably not be enough information for the beginning Earth Science teacher to organize his first field trip. The following are examples of possible locations and some of the things which can be found at these locations. These exact locations, of course, could not be used by most Iowa Earth Science teachers. They are only examples of the kinds of locations that are available to teachers of Earth Science.

1. Otter Creek, Franklin County

   The Otter Creek, which is located less than a mile north of Hampton, is a good example of how a creek by erosional action can expose rock strata. At many places along the creek valley, there are excellent
exposures of Kinderhook Shale and Limestone of the Sheffied Formation. By using such an exposure, an Earth Science teacher can point out many features of geology. Some of these features are: erosional action of running water, depositional features, soil and rock profiles, stratified rock, examples of sedimentary rock, fossil beds, and perhaps various types of structural and bedding features.

Stream and also road cuts, where the glacial till is relatively thin, will almost always expose the type of features listed above. This would include most of the northern one-half of Iowa. This type of location could easily be examined during time allotted for regular classes.

2. Peat Deposits: Franklin County

There are several peat marshes less than ten miles west of Hampton. These marshes are a part of the Spring Creek Valley, which starts about twenty miles west of Hampton and runs into the city.

This type of location is another example of one which could be reached and examined during the normal fifty minute class period.
Some of the things that could be pointed out at such a location are: depositional features, early stages of compaction and consolidation of sedimentary rocks, carbonaceous sedimentary rocks, and terrain features of a marsh. The wet, marshy land could, of course, be used as a lead into the study of water tables and eventually ground water in general.

3. Sand and Gravel Pits, Franklin County

The Waynes Creek Valley, located five miles southwest of Hampton, is an excellent example of a stream exposing glacial drift deposits. These deposits are typical of the type produced by glacial outwashes. Since these deposits are rich in gravel and sand, there are numerous commercial pits throughout the creek valley. A gravel pit makes an excellent location for an Earth Science field trip. Because of the types of features that one can find at such a location, it is best to allow for more time than the normal class period. Two or three hours of time are needed for this type of location. Some of the features offered at gravel pits are: glacial and water depositional features, mechanical weathering of rocks by glaciers and running
water, soil and rock profiles, and the most important and time consuming feature—numerous examples of minerals and rocks. A gravel pit is a collection of fragments of minerals, igneous, sedimentary, and metamorphic rocks. Because most of these rocks are not native to Iowa, gravel pits will give the student the opportunity to identify and collect rocks in the field that he might otherwise never see. These identifications and collections, of course, are somewhat time consuming.

4. Rock Quarry, Franklin County

In the city of Hampton, there are three old sedimentary rock quarries. These quarries are locations that can be easily studied in the normal class period of fifty minutes. These quarries, when in use, were sources of dolomite, a building stone. Although these quarries are no longer in use, the remains are still good field trip locations. Some of the features that can be examined at these quarries are: stratifications of Mississippian Dolomite, limestone, sandstone, and chert; oolitic texture in some of the cherty dolomite, rock and soil profiles, and fossiliferous limestone.
5. Mystery Cave, Preston, Minnesota
If an Earth Science teacher is fortunate enough to be allowed a full day for a field trip, Mystery Cave in Southern Minnesota is an excellent location. Mystery Cave is located fifteen and one-half miles west and eight miles north of Preston, Minnesota. The cave is a typical solution cavern formed by the action of ground water. The sedimentary rocks in the cavern are of the Dubuque and Galena formations and the cavern was probably formed during the late cretaceous time. The cave formations composed of travertine, exemplifies Karst topology. The formations were deposited during the Pleistocene and are growing at present. Mystery Cave is privately owned and operated, so unfortunately there is an entrance fee of one dollar per person.

V. Summary and Suggestions
This field trip guide is by no means a guarantee to successful Earth Science field trips, but if the field trip guide is used by the Earth Science teacher, the probability of success will certainly increase.
There is no question that field trips are important in Earth Science education. It is unrealistic to imagine a student learning of the world around him without firsthand investigations under the direction of a teacher. However, the question of how many field trips should be taken by Earth Science students. This is not an easy question to answer, because there are several variables that could determine the number of field trips that might be taken. Some of these variables that could affect the number of field trips taken by students are the quality and number of field trip locations in the area; the training and experience of the Earth Science teacher; and the school system's field trip policy.

In general, the number of field trips taken during the school year is not as important as the quality of the trips taken. An Earth Science teacher should first concentrate on having good Earth Science field trips and then as the field trip quality improves, the teacher should try to take as many field trips a year as is needed to emphasize the concepts and ideas that are being learned by the students.

An Earth Science teacher that is inexperienced in
taking Earth Science field trips should start with field trips that are short in duration. That is, the beginning teacher should not attempt an all day field trip as his first experience. The Earth Science teacher should select locations in the community that can be investigated in a normal class period of time. Then as the teacher becomes more experienced, he can take his classes on the more extensive field trips. Two field trips during the first year of teaching Earth Science should be a worthwhile goal to achieve.

This guide has been created in hope that it will help Iowa Earth Science teachers to organize Earth Science field trips. The guide can only make suggestions to show how field trips may be organized. It is up to the conscientious Earth Science teacher to do the rest.

VI. Acknowledgment

The following have been sources of information that were used in the construction of this guide:


C. The forty-four Iowa Earth Science teachers that responded to the questionnaire sent to them in December, 1966.

D. Iowa Geological Survey Office, Iowa City, Iowa.
CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The problem. The purpose of this study was to determine the extent that Iowa high school Earth Science teachers utilize field trips and to determine the significance of field trips to them. An additional purpose and the most important reason for this study was to determine the best procedures that Earth Science teachers can follow in developing and executing field trips. This information was then compiled and used in the creation of a field trip guide. This guide can be used by Earth Science teachers in organization and execution of Earth Science field trips.

The procedure. In solving part one of the problem, a questionnaire was sent to fifty Iowa high school Earth Science teachers. The data gathered from the responses to the questionnaire were compiled and analyzed. Some of the information from the questionnaire, along with information obtained through teacher interviews and the analysis of published materials was used to show the need of a teacher field trip guide. This same information from the questionnaire, interviews, and published material analysis was then used in the development of an Earth Science teacher field trip guide.
I. SUMMARY

The data compiled from the responses to the questionnaire in Chapter II indicated that 41 per cent of the Earth Science teachers did not take field trips and 55 per cent took less than five field trips during the school year. The responses to the questionnaire also indicated that even though many Earth Science teachers did not take field trips, most felt that field trips had value in an Earth Science course of study. The data from the questionnaire pointed out that the main reason Earth Science teachers gave for not taking more field trips was "lack of time." The responses showed 48 per cent felt "lack of time" the main reason for not taking more field trips.

The questionnaire responses also pointed out that 20 per cent of the Earth Science teachers did not take more field trips because of lack of college training.

The final important data compiled from the questionnaire responses dealt with the need of a guide to help Earth Science teachers organize field trips. Forty-three per cent of the Earth Science teachers responding to the questionnaire felt that they very definitely would take more field trips if a guide were available to help them organize field trips.

The questionnaire data were primarily used in solving part one of the problem. Direct responses by Earth
Science teachers were another source of data that was used for this project.

The correspondence and personal interviews with Earth Science teachers were used to acquire additional information pertaining to two areas: (1) to find out what instructors of Earth Science meant when they said they did not have enough time for field trips, and (2) to obtain suggestions that helped in the development of a field trip guide.

When an Earth Science teacher said that he does not have enough time to take field trips, this usually meant one of two things: (1) if he took field trips during the normal class period, he found the fifty-five minute period too short; and (2) since the normal class period was not enough time to take a field trip, all day or half-day field trips were tried. Some Earth Science teachers could not obtain administration approval for longer field trips so decided to take no field trips. Other Earth Science teachers obtained administrative approval for longer field trips, but when they tried them, they found they could no longer control the Earth Science students. When the longer field trips were used, all the Earth Science students took the field trip and the group became too large to control.

The solution to this problem, as pointed out in the field trip guide in Chapter IV, is to use the time of the
normal class for field trips only when the field trip location is close to the school and the scope of the location is small. When the all day or half-day field trip is used, the Earth Science teacher must solicit help from administrators, other science teachers, or interested people in the community to help with the supervision of the students.

The analysis of published materials pertaining to Earth Science in Chapter III, showed a trend taking place today to reject ninth grade general science from the high school curriculum and to replace the general science with a laboratory science. The most popular replacement for ninth grade general science is Earth Science. Earth Science, however, is an unusual laboratory science in that part of the Earth Science laboratory is the earth itself. Since it is impossible to study the earth itself in a conventional high school science classroom, it becomes necessary to take the classroom outside. That is, it becomes necessary to take students on Earth Science field trips. In all of the sources of Earth Science curriculum studied, the need for field trips was emphasized.

Field trips are nothing new. Every year thousands of high school classes take field trips. The Earth Science field trip, however, is different from the conventional field trip. If many of the concepts and ideas presented
in an Earth Science course of study are to be developed and understood, laboratory procedures of discovery must be experienced by the student. And when the subject of the student's study is the world around him, his laboratory for discovery becomes the Earth Science field trip.

Because teachers as a whole have had poor experiences with field trips and because the Earth Science field trip is more than an excursion to points of interest, it is not surprising that many Earth Science teachers are not taking their classes on field trips.

There is no way that field trips can be organized to guarantee a successful excursion. However, careful planning of the Earth Science field trip will insure a greater degree of success.

If the Earth Science teacher follows the steps of organization of field trips as suggested in the field trip guide presented in Chapter IV, the probability of success will most certainly increase.

II. CONCLUSIONS

On the basis of the data obtained from this study, the following conclusions concerning Earth Science field trips conducted by Iowa high school teachers of Earth Science were made:
1. Most Iowa high school Earth Science teachers take their Earth Science students on few or no field trips.

2. Even though most Iowa high school Earth Science teachers take their Earth Science students on few or no field trips, they feel that field trips are important in Earth Science and they would like to take more.

3. The reasons Iowa Earth Science teachers do not take more field trips are:
   a. Earth Science teachers have difficulty in organization and planning of field trips.
   b. Earth Science teachers do not have sufficient training and experience in dealing with field trips.

4. Earth Science field trips are a form of a laboratory exercise that must be performed by Earth Science students if they are going to develop the desired understanding of the earth.

5. There is a definite need for a guide to help Iowa high school Earth Science teachers organize field trips.
III. RECOMMENDATIONS

On the basis of the information obtained from this study, the following recommendations are submitted. It is recommended that:

1. The Earth Science teachers of Iowa be informed of the importance of field trips and urged to take their students on more field trips.

2. The field trip guide developed in this study or one with similar purpose be distributed to the Earth Science teachers of Iowa to help them organize Earth Science field trips.

3. The colleges and universities of Iowa that are training the future Earth Science teachers include in their curriculum a unit of study to inform future teachers the procedures involved in developing Earth Science field trips.
BIBLIOGRAPHY


Ray, Chalmer J. "Earth Science Curriculum Project (ESCP)," Course and Curriculum Improvement Projects, National Science Foundation, NSF 66-22, (September, 1966).


APPENDICES
APPENDIX A

LETTER TO IOWA HIGH SCHOOL EARTH SCIENCE TEACHERS

High School Science Dept.
Hampton Community High School
Hampton, Iowa

Dear Earth Science Teacher:

I'm sure that you have received many requests from graduate students for help on a graduate project. If you are like me, you're not overjoyed when you get another request. However, if you could find the time to complete the enclosed questionnaire, you will help a fellow teacher move higher on the pay scale.

One big problem that I have had as an Earth Science teacher, is to have successful field trips. Too many times, I have returned from a field trip saying to myself never again; yet, I fully realize the importance of field trips in a good Earth Science course. I have, however, concluded that there must be a better way of planning field trips than the way that I have been doing it.

This then is the basis for my graduate project. I will attempt to find a procedure or format to follow when taking students on an Earth Science field trip that will assure success. Your help by doing the enclosed questionnaire will aid in the development of this procedure.

If there are any other suggestions that you may have that will help on this project, please include them on the back of the questionnaire.

Also enclosed is a self-addressed, stamped envelope.

Thank you for your help.

Sincerely,

William C. Fertelson
APPENDIX B

THE QUESTIONNAIRE

William C. Bertelson
Hampton Community High School
Hampton, Iowa

Earth Science Field Trip Questionnaire

Please circle the choice that best answers the question for you.

1. At what grade does your school offer Earth Science?
   (1) 9th (2) 10th (3) 11th (4) 12th.

2. This course is: (1) required (2) elective.

3. At what grade level do you feel an Earth Science course should be offered?
   (1) 9th (2) 10th (3) 11th (4) 12th.

4. How many students are enrolled in Earth Science in your school?
   (1) less than 50 (2) 50-100 (3) 100-150 (4) more than 150.

5. What is your average class size in Earth Science?
   (1) less than 10 (2) 10-20 (3) 20-30 (4) more than 30.

6. How many field trips does your Earth Science class take during the school year?
   (1) none (2) less than 5 (3) 5-10 (4) more than 10.

7. What value do field trips have in your Earth Science class?
   (1) no value (2) little value (3) some value (4) great value.

8. How many locations do you have in your area that are suited for Earth Science field trips?
   (1) none (2) less than 5 (3) more than 5 (4) may be some but do not know.

9. What do you feel is the major reason why you don’t take your Earth Science classes on more field trips?
   (1) lack of time (2) lack of locations (3) administration disapproval (4) lack of college training
to enable you to organize field trips (5) class size too large for field trips.

10. What do you feel is the ideal class size to take on a field trip? (1) less than 10 (2) 10-20 (3) 20-30 (4) more than 30.

11. Would you take your classes on more field trips if a guide was available that would show you how to organize Earth Science field trips? (1) no (2) maybe (3) very definitely would.

12. Would you take your classes on more field trips if a guide were available that would point out locations in your area for Earth Science field trips? (1) no (2) maybe (3) very definitely would.

13. Would you like a copy of this project when finished? (1) no (2) yes.
APPENDIX C

THE SERVICES AVAILABLE PERTAINING TO FIELD TRIPS FROM GOVERNMENTAL AGENCIES

1. United States Geological Survey Office, Rolla, Missouri. This is the regional office of a bureau of the Department of the Interior. It furnishes reliable information about the location of mineral deposits, and detailed maps. For a modest fee, a teacher can obtain detailed topographical maps by writing the office at Rolla, Missouri. These maps contain a complete detailed description of all surface features, including elevations and depressions and locations of mining operations. This information can be valuable to the teacher for two purposes: (1) Aid in locating field trip sites and (2) teaching aids in map reading and the familiarization of the topography of a region.

When requesting maps from a Survey Office, be sure to give the information pertaining to the locations that you wish included on the maps. For example: If you want a map of your own region, be sure to say that you want the map that includes Hampton, Iowa, Franklin County. This is necessary because these maps being so detailed only cover small geographic areas.

2. State Department of Agriculture, Des Moines, Iowa: Information pertaining to soil types and conservation practices can be obtained through this State Agency. In
particular, the Conservation Commission and Iowa Conservation Education Council can supply the teacher with source information for field trips. These agencies can provide the teacher with information pertaining to the soils of Iowa, water supplies and conservation practices, rock, mineral, and fossil deposits in Iowa, and types of natural sites found in the state parks.

In 1962, the committee of the Iowa Conservation Education Council prepared a source book to be used by Iowa teachers. Included in this source book is information pertaining to field trips and activities that can be used by Earth Science teachers. This book can be obtained by writing any of the named conservation agencies at Des Moines, Iowa, or the Iowa State University Press, Ames, Iowa. The title of this book is "Conservation Source Book" by the Iowa Conservation Education Council.

3. United States Weather Bureau, Des Moines, Iowa. Just for the asking, this governmental agency will provide the teacher with many pamphlets and brochures pertaining to meteorology. In particular, the Weather Bureau Office located at the Des Moines Airport is a good site for a field trip. The meteorologist at the Des Moines Office is most happy to take a class on a tour of the facilities. This tour will give the students an excellent firsthand experience of the procedures conducted by the Weather Bureau in gathering data pertaining to the weather and in making forecasts.
If you desire to make a tour of the Weather Bureau, be sure to make your request in advance because there are many such tours given in a year. Also, include in your letter of request, information pertaining to the number of students and the level of instruction you desire.

4. Iowa Geological Survey, Iowa City, Iowa. Like the United States Geological Survey Office, this agency is an excellent source of maps. The types of maps available through this agency are terrain maps, contour maps, relief maps, and sub-terrain relief maps showing rock formations.

The most important service, however, offered by the Iowa Geological Survey is in the area of field trips. Upon request, a geologist will visit a school and provide first-hand instruction to an Earth Science teacher pertaining to geological field trips in that area. Also, the Survey Office is now in the process of organizing field trips that will be conducted by the geologists of the Agency.

This program when completed will be available to teachers in all areas of the State and will pertain to the features of those particular regions. This program will have the primary goal to educate teachers so that they will be able to conduct their own field trips in the future.

Another service offered by the Iowa Survey Office is in the area of published reports. Over the years, the Geologists of this agency have conducted research projects covering the entire State. The content of these projects
pertains to the geological features of the State. The results of these projects have been published and are available through the Survey Office. The reports can also be found in most large municipal and college libraries.

5. State Department of Public Instruction, Des Moines, Iowa. Upon request, an Earth Science teacher can obtain a booklet called: "The Geology of Iowa," put out by the Iowa Geological Survey Office and "Earth Science Curriculum Project" (ESCP) materials from this governmental agency.

According to Paul Tweeten, Science Consultant, the State Department of Public Instruction is now in the process of developing a brochure which will point out field trip locations. This brochure should be available sometime during the year, 1968. These are the services available through this agency.