

## Earth Science Teaching in the Secondary Schools of Indiana

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An earth science course in the secondary schools of Indiana is a relatively new innovation. The purpose of this study was to provide information about earth science teachers and to learn what are some of the problems they are faced with in conducting this new course.

This secondary school instruction in earth science will have a direct bearing on the enrollments in those college departments which deal with some phase of earth science. Some students with an inclination toward a scientific career may become interested in earth science after taking such a course and decide to major in one of its numerous branches in college.

The responsibility for maintaining viable earth science courses in secondary schools rests, of course, with the teachers and supervisors of the respective school systems. However, we teachers at the college level cannot divorce ourselves completely from the secondary school system. Many of its students ultimately become our students. If we can help them become better prepared for college study then it is beneficial to both the students and ourselves. The Earth Science Curriculum Project was just such an acknowledgment of our responsibility toward better secondary school education.

The Indiana University School of Science has a list of secondary school earth science teachers in Indiana. A three-page questionnaire was sent to the 165 teachers on this list. Seventy-three questionnaires were returned, sixty-eight from earth science teachers and five from teachers who did not teach earth science. It is likely that a number of teachers who did not return the questionnaire do not teach earth science.

The following list contains the counties in which there are earth science teachers:

County with 9 teachers: Marion

Counties with 6 teachers: Allen, Lake

County with 5 teachers: Bartholomew

County with 4 teachers: Delaware

County with 3 teachers: Porter

Counties with 2 teachers: Fulton, Hamilton, Howard, Jackson, Madison, Montgomery, Tipton, Vigo

Counties with 1 teacher: Boone, DeKalb, Dubois, Elkhart, Harrison, Hendricks, Henry, Jefferson, Knox, Kosciusko, LaPorte, Noble, Orange, Parke, Posey, Randolph, Spencer, Sullivan, Vermillion, Wayne

A few of the respondents taught seventh or eighth grade courses in earth science. These classes were not included in this survey, since I was concerned with senior high school. However, the teachers were included with the senior high school teachers of this survey.

The large majority of school systems offered a two-semester course rather than a one-semester course. The median number of weeks devoted to each phase of earth science in the two-semester courses were:

Introduction	2 weeks
Geology	16 weeks
Astronomy	6 weeks
Meteorology	6 weeks
Oceanography	4 weeks

In the senior high school for 1967-68, there were 3924 students in 142 sections for a mean of 27 students per section. The approximate enrollment for 1966-67 was 3566 students. This shows an increase of approximately 350 students during 1967-68 over 1966-67 or approximately 13 sections of 27 students.

Earth science teaching in Indiana really began in the last decade as the following list shows:

<i>Number of schools offering earth science for the first time</i>								
1928	1958	1960	1962	1963	1964	1965	1966	1967
1	2	1	2	3	3	5	18	5

Earth science is taught in various schools from grade 7 through grade 12. The schools were divided into 32 teaching the course to a single grade and 29 teaching multiple grade sections. The majority taught earth science in grades 8-10. Two schools offered it to seventh graders and 21 offered it to grades 11 and 12.

The teachers were requested to supply information about the academic ability of their students. The following list is the median percentages of earth science students:

College caliber	30%
Terminal high school	60%
Potential drop-outs	10%

There was approximately a 3:1 favorable response to the question, "Should the earth science curriculum be expanded?" Those who favored curriculum expansion usually listed more than one of the following: more laboratory equipment (34 teachers); more laboratory space (24 teachers); more library volumes (20 teachers); more teachers (6 teachers).

The greatest problems of earth science teachers were mainly: low ability of students (21 teachers); lack of equipment (19 teachers); lack of background courses of respondent (16 teachers); lack of space (12 teachers); lack of library volumes (10 teachers); lack of student interest (9 teachers); lack of administration interest (4 teachers).

Approximately 30% of the teachers used the text prepared under the supervision of the Earth Science Curriculum Project. In view of the fact that the text has been available for a short period of time, it is being used by a large number of students in Indiana.

The two training areas which the teachers found most beneficial to their teaching were: courses attended on a degree program and N.S.F. Summer Institutes. To a lesser extent were: in-service-training and field work.

Slightly more than half of the teachers had never attended an N.S.F. Summer Institute. The great majority of those who had attended an institute replied that they had attended either one or two.

In nearly every case, those who took an N.S.F. Summer Institute course in earth science listed the Institute as their most helpful training for teaching earth science.

The median number of years as a teacher listed by the respondents was eight. The median number of years as an earth science teacher was two. This tends to indicate that the majority of the earth science teachers were not originally trained as such. This point is further proven later in the report.

Approximately 65% of the teachers had a master's degree. Those with a bachelor's degree only had a median of 6-10 hours beyond the bachelor's degree. Those with a master's degree had a median of 20+ hours beyond the master's degree.

The science background of the teachers was examined. The following list gives the particular science and the median number of semester hours credits of the teachers. This question was arranged so that each respondent could check 0 hours, 1-9 hours, 10-20 hours, or 20+ hours.

*Median semester hours credit of earth science teachers*

Earth Science (1-9)	Geology (1-9)
Astronomy (1-9)	Meteorology (0)
Oceanography (0)	Chemistry (10-20)
Physics (1-9)	Biology (20+)
Mathematics (1-9)	Geography (1-9)

The courses which the majority of teachers thought would be most beneficial to their teaching were: Oceanography (76%), Astronomy (61%), Geology (60%), and Meteorology (38%). Judging from the median semester hours of the teachers' background, it is obvious that they recognize their deficiencies. What is surprising though is that so few of them felt a course in Meteorology would be beneficial since more than 50% had never had such a course.

Approximately 10% of the teachers listed earth science or geology as their major for the bachelor's degree, while approximately 40% listed biology as their undergraduate major. The remaining teachers mainly listed various fields of the natural or biological sciences as their undergraduate major.

Those teachers with a master's degree mainly listed the following majors: education (35%), earth science (25%), and biology (15%). Their graduate degree minors were mainly education (40%) and biology (25%).

### Summary

The typical earth science teacher in Indiana has the following characteristics. He—the large majority are men—has a master's degree in education or earth science and a bachelor's degree in biology. He has more than twenty hours of course work beyond the master's degree, which means that he has probably spent a number of his summers in school since he has only been teaching for eight years.

He has taught earth science for the last two years, so he must have taught another science, probably biology, general science, or possibly chemistry during most of his career.

There is a 50% likelihood that he initiated the earth science course at the school in which he now teaches. The school is located in an urban area and his students are in the ninth or tenth grade. His pupils are in the upper half of their class and a substantial number will continue their education after high school graduation.

There is a 50% likelihood that he attended at least one N.S.F. Summer Institute in earth science. If he did attend such an institute he feels this was his best training for instructing his earth science classes.

He wishes to expand the earth science course at his school with the addition of more laboratory equipment. He would also like to take additional courses in oceanography, astronomy, and geology in order to improve his teaching ability.

This study illustrates that earth science teachers in Indiana generally did not major in earth science at college. However, there is a sizeable minority, nearly 20%, who do have a master's degree in earth science. Those teachers whose major field was other than earth science have been greatly helped by having attended an N.S.F. Summer Institute in earth science.

Earth science teaching in Indiana has really come about within the last ten years and as the number of pupils continue to expand, there is little doubt that their instructors will become better qualified to teach the subject.