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Kenneth E. Frazier

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Motivating the Earth Science Student

KENNETH E. FRAZIER

Abstract. A study to determine teacher controlled motivating factors that could be improved in the E.S.C.P. program. This involved questionnaires completed by 266 ninth grade students and 295 twelfth grade students. The study indicates that certain factors could and should be improved.

This study was undertaken to determine if the earth science course offered in the author's school system should be continued as a required course or if it should be offered as an elective, along with biology. There had been much discussion about the subject being uninteresting, too difficult, with too many labs, graded too strictly, and with much material covered in previous grades repeated. The author wished to determine how much of this was governed by teacher-controlled motivation.

To get some statistical information, a questionnaire was prepared and administered to the students. In this school system classes are grouped homogeneously according to the top 50% and the bottom 50% with very few exceptions. Exceptions are placement errors. 266 junior high students and 295 senior high students completed the questionnaire.

The first thing to be determined was the percentage of the students who would take earth science if it were not required, and to determine why they answered as they did. 41% of all junior high students replied "Yes" and 59% replied "No". Similar results were obtained from the high school where 42% replied "Yes" and 58% replied "No". In considering graph 1, it should be noted that "Teacher-A" is a first year teacher with a B.A. in earth science and presently working toward a masters degree in earth science; "Teacher-B" is a teacher with twenty years experience, (first year with lab centered E.S.C.P.), a masters degree in geology and is working toward a Ph.D. in geology; "Teacher-C" is a teacher with twelve years experience, (four years with lab centered E.S.C.P.), a masters degree in education with major work in biology and is working toward a Ph.D. in earth science education.

At the junior high level reasons varied considerably depending upon which teacher the student had. The most prominent responses by the "No" group were: (1) uninteresting, (2) non-practical (3) don't like any science, and (4) a variety of reasons. The responses from the senior high were surprisingly similar, although fewer of the students stated a particular reason. Those responding listed: (1) uninteresting, (2) non-practical (3) don't like any science, (4) a variety of responses (Fig. 2). The "Yes" group in junior

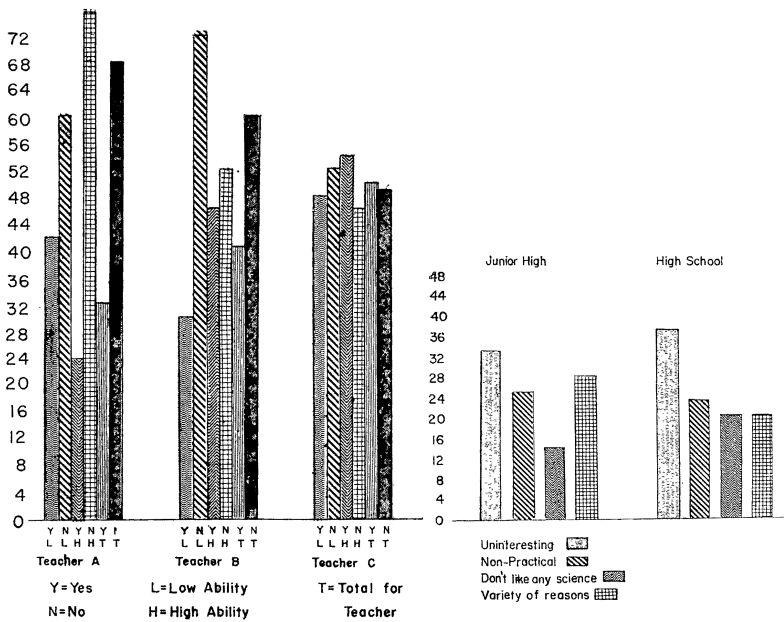


Fig. 1. Would you take earth science if you did not have to?

Fig. 2. Why would you not take earth science?

high listed such things as: (1) like earth science, (2) college bound, (3) like all science. Again, the high school students were similar listing (1) college bound, (2) liked earth science, (3) like all science, (4) see relationship of this to other courses, and (4) a variety of reasons (Fig. 3).

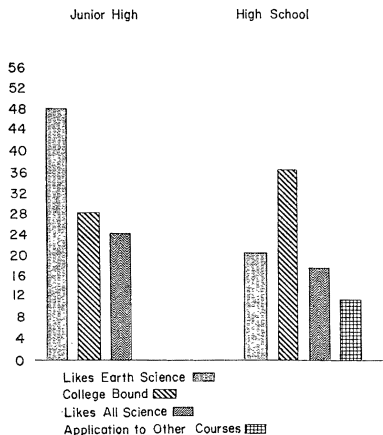


Fig. 3. Can you recall any earth science that was taught in the previous grades?

To learn if there was too much repetition, the second question was: "Can you recall any earth science taught in the previous grades?" The junior high response was: "Yes", 65% and "No", 35%. The high school response was: "Yes", 70% and "No", 30% (Fig. 4).

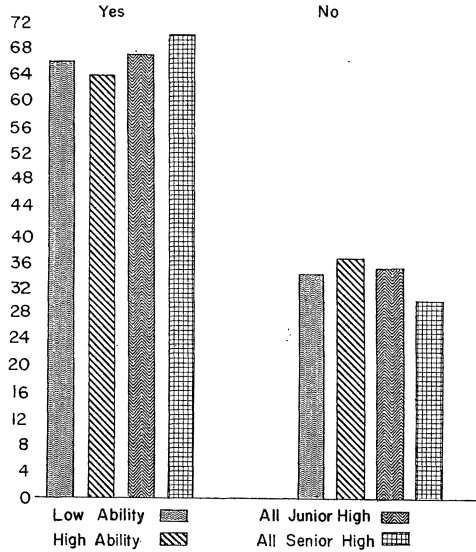


Fig. 4. Why would you take earth science?

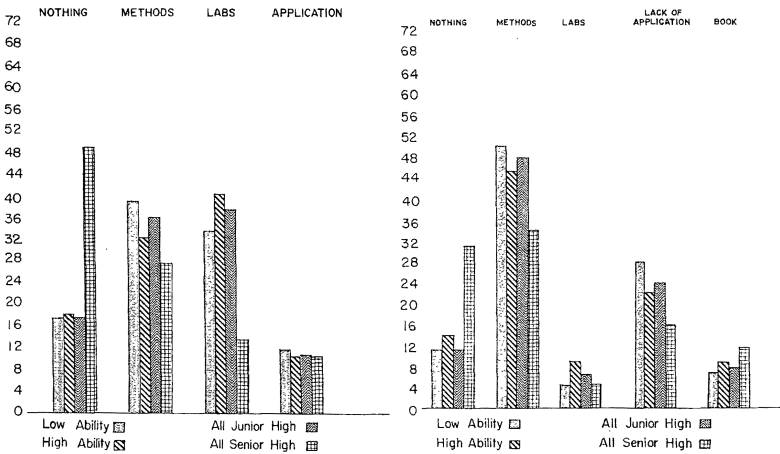


Fig. 5. What one thing has motivated you, or could motivate you, to grasp earth science materials to a higher degree?

Fig. 6. What one thing has tended to dampen your interest in earth science?

Responses to the question "Write a paragraph or two telling what you, as a student, think has motivated you, *or could motivate you*, to grasp earth science to a higher degree" are shown in Fig. 5. The replies fell into four categories: (1) methods, (2) labs, (3) application, and (4) nothing. Between 80 and 90% replied in two categories, "methods" and "labs". I think both categories fall into the realm of teacher-controlled motivation. It is surprising to note the similarity among all groups except the high school groups for "nothing" and "labs". It should be mentioned here that the high school group was the first to take the course, much of the equipment was late in arriving and many students noted this in the questionnaire.

Another question was directed toward methods of motivation. It asked to "Give the one thing that has tended to *dampen* your interest in earth science." Once again the replies fell into just five categories: (1) methods, (2) labs, (3) lack of application, (4) book, and (5) nothing. 79% of the students listed "methods", "labs", or "lack of application" (Fig. 6). All are believed to fall into the realm of teacher-controlled motivating factors.

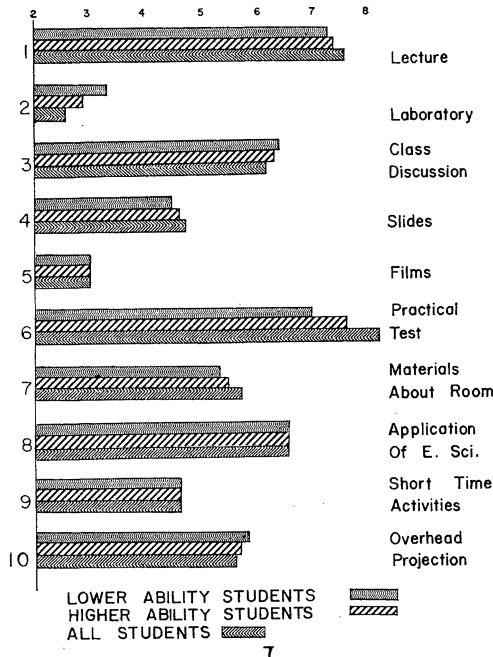


Fig. 7. Methods considered best by students. Tabulated by Student Ability/Teacher-A

In another question students were asked to rate ten of the system's most widely used methods. These are: (1) lecture, (2) laboratory, (3) reading and class discussion, (4) slides, (5) films, (6) practical tests, (7) materials to observe about the classroom, (8) relating earth science to other subject, (9) short time class activities (5 to 10 minutes), (10) overhead projection. They were asked to give a rating between one and ten with *one* being the *best* liked method and *ten* the *least* liked. The results were plotted using low ability and high ability for individual teacher's groups and then using the over-all totals grouped as one (Figs. 7-10). All had identical peaks and valleys. It is felt that the high interest methods should be used most often and the low interest methods should be used sparingly.

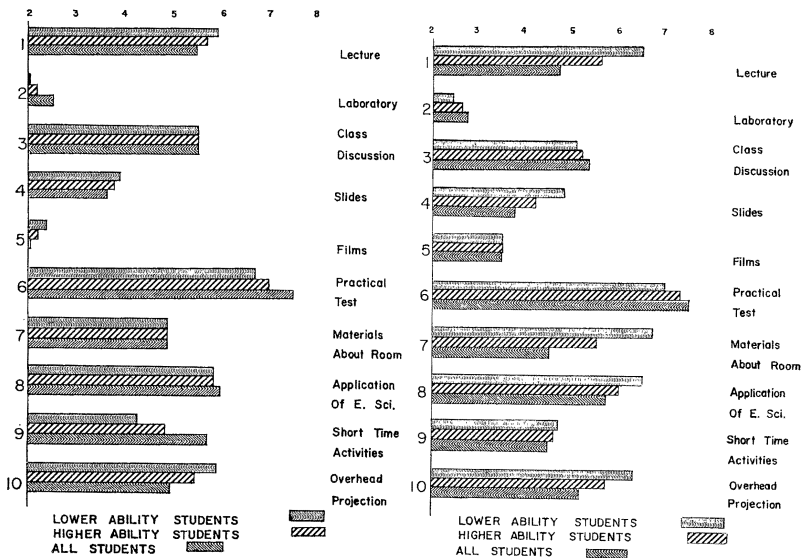


Fig. 8. Methods considered best by students. Tabulated by Student Ability/Teacher-B

Fig. 9. Methods considered best by students.

High school students were asked two additional questions. The first: "If you took any further science in high school, did you notice any carry-over or applications that were useful?" From this group, 36% said they did not take any further science. This figure is probably significant if it is related to the question which asked if they would take earth science if it were not required. One wonders if this 36% would have taken *any* science if they did not have to! This would cut the anti-earth science group by about 62%. Of the remaining 64% that indicated they did take further science, 63%

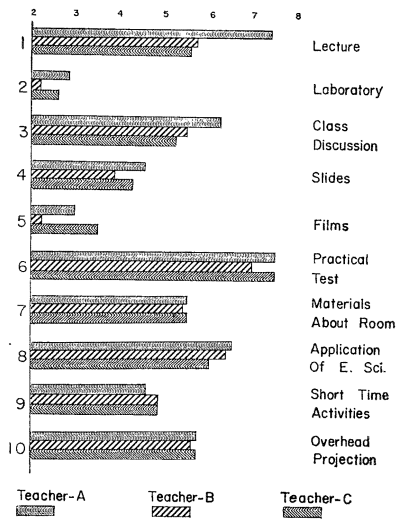


Fig. 10. Methods considered best by students. Tabulated by Teacher

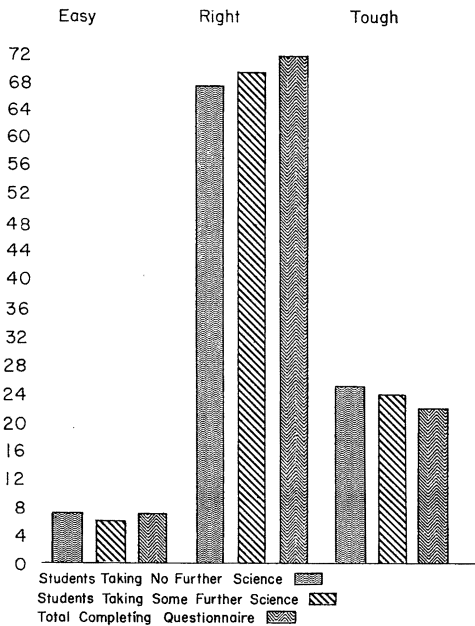


Fig. 11. Was grading too easy, about right or too tough?

said there was carry-over and 37% said there was none. This seems to indicate that perhaps the junior high should remain, as original-

ly intended, an exploratory area to broaden backgrounds even if the individual student can see no relationship to other classes while in the ninth grade.

It has often been said that grading is a motivater. The question: "Was grading too tough, not tough enough, about right?" Asked as the last item for the high school students. 7% thought the grading was too easy, 23% thought it too tough, and 70% thought it about right. It appeared to make no difference whether the student took further science or not (Fig. 11).

Based on the evidence found in the study the author concludes that to motivate the earth science student in junior high, the teacher must (1) use a wide array of methods (2) use any single method for short periods at a time, (3) do his best to relate the material to everyday living, current events, and possibility of carry-over to other science classes, (4) show a genuine interest and enthusiasm in the material he is trying to present, (5) have a rather broad background in study, travel, and work experience, (6) and last, but by no means the least, he must have an administrative staff that can see the need for the proper equipment to run the labs and present the modern materials that are available for varied instruction.