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Factors That Do Not Separate Effective and Ineffective Science Teachers

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With only two exceptions, no significant differences are found in the profiles of most effective and least effective teachers.

Druva and Anderson (1983) recently reported the results of a meta analysis of significant research in science teacher education. Their findings suggest that most factors believed to impact the teaching performance of science instructors do not, in fact, play a very important role. Despite these findings, many science educators continue to accept the same old assumptions and beliefs concerning what is needed to improve science teacher education programs.

As the National Science Foundation expands programs in response to new appropriations and directives from Congress, and the National Science Teachers Association suggests more stringent certification requirements and minimal standards (NSTA, 1984), perhaps an examination of the underlying assumptions and beliefs in light of the research evidence is in order.

Most supervisors, administrators, department chairs, and science teachers themselves insist that they can identify excellent and poor science teachers, and can give descriptions of what such teachers do. While they may be right, in most instances it has been shown that good and bad teachers cannot be distinguished by the correctives commonly proposed for improving teaching and teachers.

Given this situation, Druva and Anderson undertook an investigation in Iowa. Science supervisors and department chairs in secondary schools assisted the investigators in identifying up to three of the most effective and least effective science teachers in their schools. Twenty-seven supervisors and department chairs agreed to participate in the identification process.

These 27 people were asked to provide personal information about the least and most effective teachers — without divulging the names of the teachers in these two categories. However, only ten of the supervisors/department chairs were able to investigate the school personnel records to provide the needed information. Ultimately information was made available concerning 27 most effective and 26 least effective science teachers in ten Iowa school districts.

Information obtained in the study included gender, age, grade level taught, number of different teaching preparations, years of teaching experience, planning periods, semester hours of credit in the undergraduate preparatory program, semester hours of graduate preparation in science, total number of

weeks of NSF institutes attended, and number of in-service experiences elected for continued staff development. The information for the 27 teachers rated most effective was averaged for each category so that comparisons could be made with the input for the least effective teachers. Chi squares were computed to test for significant differences in the comparisons for each condition between groups.

With only two exceptions, no significant differences were found. Most and least effective science teachers (as identified by supervisors and department chairs) were not found to differ as to gender, age, grade level taught, science discipline taught, total number of teaching preparations, amount of undergraduate science preparation, amount of graduate science preparation, or type of undergraduate pre-service program (Table 1). Thus, assumptions that teaching load, science field, experience, and science preparation play important roles in differentiating effective and ineffective teachers were not substantiated by this investigation.

Table 1

COMPARISONS OF CHARACTERISTICS OF SCIENCE TEACHERS JUDGED MOST AND LEAST COMPETENT

Characteristic	Number of Teachers: Most Effective	Number of Teachers: Least Effective	Significant Difference*
1. Average Age	43	42	No
2. Years Experience	18	21	No
3. Number of Females	7	10	No
4. Number of Males	20	16	No
5. Teaching Preparations (courses)	2.3	2.8	No
6. Undergraduate Science Preparation (sem. hrs.)	48	50	No
7. Graduate Science Preparation (sem. hrs.)	28	25	No
8. Weeks in NSF Institutes	16	8	Yes*
9. Number of In-service Programs Elected (during past five years)	65	1	Yes*
10. Junior High Teachers	9	8	No
11. Biology Teachers	14	15	No
12. Chemistry Teachers	1	2	No
13. Physics	2	1	No
14. Teachers of "other" science	1	0	No

*Chi square significant at 0.05

n = 27 most effective teachers
n = 26 least effective teachers

On the other hand, quantity (perhaps quality) of experience with NSF institutes, and quantity (or again, perhaps quality) of in-service programs *elected* by teachers yielded significant differences (Table 1). Teachers judged to be most effective were reported to have experienced significantly more NSF institutes

and to have elected significantly more optional in-service experiences than were those teachers identified as ineffective. As many have thought, the most effective science teachers continue to grow professionally by expanding their repertoire of teaching strategies and by pursuing experiences designed to expand their horizons.

Perhaps many of the new initiatives designed to increase science requirements for certification, to increase subject matter competencies of in-service teachers, to alter teaching loads and assignments, to change the rules for teachers and teaching are destined to miss-the-mark. And, in supporting them, we may be fooling ourselves, the teachers, and the public while spending considerable time, effort, and money to no avail. Perhaps now is a time to think anew, to consider the meanings of this small study. By doing so and taking appropriate action, we may devise or revive a truly useful solution.

References

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